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EDITORIAL.

Approved Fungicides.

The general prevalence during the last decade of Mouldy Rot disease of the renewing bark of rubber trees in Malaya naturally led to the introduction on the market of numerous preparations intended for its treatment and control. As little was known from practical experience of the efficiency of several of these preparations in destroying the causative fungus, or of their effect on the delicate renewing bark, it became desirable to devise a scheme by which they could be tested and approved for general use.

This number contains an account of the scheme devised by the Department of Agriculture and the Rubber Research Institute of Malaya for this purpose.

The scheme is designed to assist and protect both the manufacturers of fungicides and the rubber planters. The fact that over forty fungicidal preparations have been tested is proof that manufacturers have taken full advantage of the facilities offered; while, as only a small proportion of such preparations successfully passed the tests, it is obvious that planters have received a valuable measure of protection against unsuitable preparations.

It is not to be inferred that the proprietors of the unsuitable products had imposed, or were intending to impose on the public; it merely means that a fungicide which is suitable for other purposes may be unsuited for the treatment of this particular disease. Further, it is necessary to point out that fungicides which have been placed on the "White List" for Mouldy Rot treatment are not necessarily suitable for other diseases of the rubber tree.

Another most important aspect of these tests is to decide on the optimum dilution of the fungicide. In view of the fact that the preparation is applied to the delicate cambial tissues exposed by the tapping process, it is essential that its concentration should be no greater than is necessary to destroy the fungus without damaging the renewing bark. The author points out that fungicides which cause bark-burning at or near the strength required for killing the mould are regarded as unsuitable, and this has been the chief reason for rejection of many proprietary products.

Every effort has been made to encourage the use of approved fungicides by small-holders. Arrangements have, in most cases, been made to ensure that such

fungicides are on sale at Asiatic shops frequented by owners of small areas of rubber; in addition, fungicides may be purchased at the offices of the Field Branch of the Department of Agriculture throughout the country.

The scheme has succeeded in making available several fungicides which, if applied as and when recommended, can be relied upon to effect control of the disease within a period of one month.

Experiments with Derris.

Considerable attention continues to be directed to the subject of derris by would-be planters and by those concerned with the trade in the dried root. An article on this subject was published in this Journal in October 1935 which summarized the information available at that time, and which referred the reader to the available literature on the subject.

Many points of importance regarding the toxic properties of the varieties and the cultivation of the crop remain unsolved, and are the subjects of further work in which the Chemical and Agricultural Divisions of the Department are closely collaborating. The first-fruits of this collaboration will be found in the article in this number which deals with varietal and manurial trials with derris. This is the first of three articles to be published in this place; the subsequent contributions to this subject will deal with preliminary selection experiments with derris, and with the present standards of Malayan derris.

In the present article, the authors shew that very considerable amounts of plant nutrients are removed from the soil by a crop of derris, and point to the necessity of manuring if the land is to be kept continuously under cultivation with this crop. Pursuing this line of investigation it is shewn that manuring and liming gave increased crops.

Finally, the authors show that whereas toxicity is not markedly affected by change of environment, there is, however, a variation between individual plants in consequence of which planting material should be taken from a wide range of plants.

In the past, fears have been expressed that the high toxic properties of plants cultivated in one district could not be maintained with a change of environment. The results of the present work will allay these apprehensions.

Effect of Salt Water on Padi.

We include a short note on the effect of irrigation of padi with salt water which is the first of a series of interesting pot experiments dealing mainly with the manuring of this crop. Other papers in the series will be published in subsequent numbers of this Journal.

The object of the present experiment was to obtain information on the amount of salt which padi can withstand, a subject of importance as the irrigation water for padi areas near the sea is sometimes contaminated with sea-water. The results shew that this crop is unlikely to withstand much over 2 per cent. concentration of salt for a lengthy period.

Original Articles.

THE F.M.S. GOVERNMENT SCHEME FOR THE TESTING AND APPROVAL OF FUNGICIDES FOR THE TREATMENT OF MOULDY ROT ON RUBBER TREES

BY

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The discovery of Mouldy Rot disease (*Ceratostomella fimbriata*) of the tapping panel of rubber trees in 1916 presented to plant pathologists a unique problem in that the plant tissues affected by the disease were as delicate, if not more so, than the fungus which caused the disease.

It was early discovered that the delicate cambial tissues exposed by the tapping process were particularly sensitive to the contact of minerals or liquid sprays containing dissolved mineral salts. The use of organic compounds, represented by such proprietary tar-acid mixtures as Jodelite, Dougalite, Solignum, Noxo, Brunolinum and Coal tar, normally used for the preservation of structural timber, was investigated and it was found that, when applied neat, they caused considerable damage to the tapped surface of the tree so that weaker mixtures made by emulsifying these products in water with soap became the vogue. Proprietary preparations of emulsified tar oils under various names were soon available on the Malayan market.

The Rubber Growers' Association in their Third Malayan Report for 1919 issued a report upon tests of a number of various fungicides carried out by Sanderson and Sutcliffe. It was pointed out that laboratory tests on the strength of fungicides required to kill the Mouldy Rot and Black Stripe fungi bear no relation to the strength of the same fungicide required for use in the field. This report included the following thirteen desirable points in regard to fungicides:—

1. Its use should be possible in strength sufficient to kill or prevent the development of the particular organism against which it is used.
2. The planter should be able to tell by a glance that the substance has been applied.
3. It should not have a deleterious effect on the finished rubber.
4. It should not burn the tissue.
5. The penetrative power should be sufficient to be effective but not sufficient to cause wounds. (The thickness of the bark when the application is made is an important factor here).
6. The application should be simple and rapid, entailing a minimum of expense.
7. The planter should be able to rely on different samples being of constant composition or very nearly so; this applies more particularly to liquids which are used undiluted and which penetrate deeply.

8. The preparation must be easy to handle.

9. Its use must be possible daily (applies especially to liquids used as daily wash) without injurious effect on bark or wood.

10. If used in considerable dilution it is better if miscible with water.

11. It should not coagulate latex.

12. The initial cost must be reasonably low.

13. Re (12) if the initial cost is high this may be counter-balanced if the preparation can be used with effect in more dilute mixture than a cheaper preparation.

Further work on the control of Mouldy Rot is found in the Bulletins of the Department of Agriculture, Straits Settlements and Federated Malay States.

Sharples, Belgrave, Norris and Ellis in Bulletin 31 (1920) suggested the use of an emulsified form of Brunolinum known as Brunolinum Plantarium, while South and Sharples (1925) in Bulletin 37 pointed out the danger of bark damage from use of Jodelite or too strong mixture of Brunolinum and Tar or water-oil emulsions. They also stated that "laboratory tests carried out by testing cultures against percentage strength of disinfectants are useless and misleading when used as a basis for field tests". In this paper they gave an account of elaborate field tests carried out by the proprietors of the preparation "Agrisol" under the supervision of officers of the Department of Agriculture as a result of which the use of a 20 per cent. mixture of Agrisol in water was widely adopted for control of Mouldy Rot in Malaya. It was on the basis of these tests that Sharples formulated a scheme for the testing of all proprietary fungicides for use in control of Mouldy Rot with a view to providing a list of preparations which can be used with safety and give a high degree of efficacy.

It early became recognized that tests should be undertaken to provide an approved list of standard disinfectants for the treatment of this disease. The tests here discussed are concerned solely with reference to the treatment of Mouldy Rot disease of rubber and not for other rubber tree diseases.

Owing to the generally unsatisfactory position, particularly in regard to the supply of suitable fungicides to rubber small-holders, the Heads of the Pathological Divisions of the Department of Agriculture, S.S. and F.M.S., and Rubber Research Institute of Malaya agreed that standardization was not sufficient in itself and that controlled field tests were essential. Dr. Butler, Director of the Imperial Mycological Institute, London, was informed of this proposal in May 1930 and expressed his agreement with these views and mentioned that in Germany there was a scheme for field-testing of fungicides at several localities which if passed were included in a list of approved fungicides.

Later in the same year at an Inter-Departmental Conference at Kuala Lumpur it was suggested that proprietary disinfectants for treating plant diseases should conform to local Government standards. The details of methods to be followed in testing of common fungicides in Malaya were later drawn up and approved by the two Departments concerned. A scheme was then submitted to the Government,

Federated Malay States, and approved. As a result, the following notice was published in *The F.M.S. Government Gazette*, Vol. 23, No. 7, on 27th March, 1931.

"The attention of the Department of Agriculture has been directed to the necessity which exists for the standardization of disinfectants which are approved for use in the treatment of Mouldy Rot on rubber plantations.

2. From the date of this notice therefore in all notices served by the Department of Agriculture under the Plant Disease Prevention Ordinance for the treatment of Mouldy Rot only preparations will be specified which have been subjected to test by an approved authority and proved to be effective.

3. At present the list of such preparations includes:—

1. Agrisol.
2. Izal—in certain cases.

4. The Department will be prepared to extend the list to include any other preparations which have similarly been proved to be effective by approved authorities. It should be pointed out that certain other preparations in common use on estates have also been reported to give satisfactory results but, as these have not yet been subjected to systematic tests, they are not at present included in the list.

5. The approved authority for carrying out such tests for Malaya will be the Rubber Research Institute and the carrying out of such tests will in future be undertaken by the Rubber Research Institute: applications from proprietors of fungicides for the performance of such tests with a view to their inclusion in the list should be addressed to the Director of the Rubber Research Institute accordingly.

6. The tests will be made strictly in accordance with priority of receipt and also in accordance with the capacity of the Institute to deal with them when received.

7. All supplies of disinfectants required for such tests must be furnished without charge by the firms applying for such tests while the actual expenses involved in carrying out the tests must also be borne by the said firms.

8. For further information regarding tests application should be made to the Rubber Research Institute.

9. Proprietors of fungicides and their representatives in Malaya are further notified that preparations which, on samples supplied, have passed the tests prescribed by the Rubber Research Institute, will only be admitted to the list provided that the proprietors are willing and able to give a guarantee that the formula for the composition of their preparations will remain unchanged.

10. Should any proprietor of an approved fungicide desire to make any change in the composition of the fungicide he must notify the Director of Agriculture and submit samples of the preparation in its new form for further tests if required to do so. Failure to do this may entail the removal of an approved preparation from the list."

As part of the operation of the scheme it was agreed that a proprietor who wished to have his preparation tested should inform the Director, Rubber Research Institute of Malaya, from whom he would then receive a letter stating the conditions of the tests.

These conditions were based on the above Government Notification, but also made provision for the right of publication of the results by the Rubber Research Institute, whether or not the results were good. Furthermore, the applicant was informed that any complaints received by the Institute or Department of Agriculture respecting the White List would be referred to the Agents, and the receipt of more than three such complaints might, in the absence of a satisfactory explanation from the agents, entail the removal of the disinfectant from the List.

The cost of the test, to be borne by the proprietor, depended largely on the location of the test blocks. The outside estimate for a suitable test was $200, which sum was to be deposited with the Institute before the tests were undertaken.

Since the adoption of this scheme the Institute has tested over forty fungicidal preparations of which only a small proportion have successfully passed the tests and been approved for a place on the White List which at the present date is as follows:—

Name	Date gazetted F.M.S.	Concentration to be used
1. Agrisol	27. 3.31	15 to 25 per cent. in water
2. Izal	27. 3.31	3 to 5 per cent. in water
3. Black Cyllin	7. 6.32	5 to 10 per cent. in water
4. Killgerm	17. 6.32	5 to 10 per cent. in water
5. Kilsol Red	17. 6.32	5 to 10 per cent. in water
6. Brunolinum Plantarium	17. 6.32	10 to 15 per cent. in water
7. Agrisol White	6.10.33	10 to 15 per cent. in water
8. Cargillineum 'B'	28. 7.33	To be used neat
9. Durycolium	6. 5.36	To be used neat.

In this connexion it might be mentioned that a session of the Third Imperial Mycological Conference held in London in 1934 was devoted to a discussion on the "Methods of Standardization of Insecticides and Fungicides". An account of the opening speech quoted from the official report of the Conference reads as follows:—

> "Dr. Gussow (Canada) in introducing the subject gave an outline of the procedure adopted in Canada, the United States, and Germany. In Canada an Act for the regulation of the sale of fungicides was passed in 1927, the primary object of which was to prevent the sale of fraudulent products. All products have to be registered; the well-known and tested substances are granted registration immediately; those tested to a limited extent but known to be effective are allowed registration temporarily; for

those untested, experimental data are requested and tests arranged, whilst the worthless materials are refused. Applications for registration require to be accompanied by a fee of $20 gold, and the name and percentage of all ingredients have to be stated. Every registration expires on 31st December. In the United States similar control has been established. In Germany the procedure involved duplicated tests the data from which were referred to an official body, which rejects or permits the use of the material. The ingredients are either disclosed or communicated confidentially. The testing of fungicides by field tests gives the most satisfactory results, but it requires money and time, and it is very desirable that research should be undertaken in connection with the laboratory testing of such materials."

Mr. Sharples, who represented the Rubber Research Institute, gave an account of the testing of fungicides in Malaya which was very greatly appreciated by other delegates.

The following is an account of the laboratory work which led to the present method of field-testing of fungicides.

Proposed Tests for Fungicides.

1. *Microscopical.*—If in emulsion, globule size is of importance and it is found that the smaller the size of globule the greater the fungicidal effects, the more permanent the emulsion and the greater the ease of mixing with water. Large globules tend to coalesce easily to give an oily film detrimental to living plant tissues.

If in oil or paste form, the physical properties are noted for ease of use and covering power.

If in powder form, fineness and free-running, non-aggregating properties are noted.

Globule size for an emulsion is usually 1 to 2μ and not greater than 3μ-*i.e.* globules in continuous Brownian movement when in a water film. Fine powders should have the following particle sizes: Min. 3μ to 6μ, Bulk 12μ to 18μ, Max. 30μ. Larger particles, like grit, are considered unsatisfactory though a few large particles often assist in preventing aggregates and in maintaining free-running powder form, as all fine powders tend to aggregate on standing in bulk.

2. *Chemical.*—Examine chemically to determine the nature of the fungicide and its concentration from which the approximate strength for use in the field can be determined; *e.g.* a fluid which on treatment with 20 per cent. sulphuric acid shows a content of 40 to 50 per cent. of tar acids will probably be successful in the field at a concentration of 7 to 15 per cent. in water. If 90 per cent. tar acid is found, then a strength of about 3 to 5 per cent. will be necessary in the field.

If excess alkali or acid is present the product is likely to be detrimental to plant tissues.

Only one paste fungicide the composition of which was supplied by the makers has been tested.

3. *Penetration Tests on living Bark.*—The bark of a rubber tree is wounded to imitate light, medium and deep tapping over an area of bark of at least 6 x 2 inches and the fungicide is applied at various predetermined strengths to indicate (*a*) slight penetration of the bark (*b*) medium and (*c*) deep or harmful penetration and killing of the bark. The lethal strength is noted. Two to four days are usually sufficient to determine this factor.

Any damage done to the bark by volatile components or invisible fluids is often difficult to detect, but a good test is to make a knife-edge cut into the remaining bark across the wound and to note the condition of the latex or juice which flows out. A thin, almost colourless fluid indicates danger and it is often found that the cambium beneath is discoloured —being more sensitive to the gas or fluid—and slowly dies. A thin, milky fluid shows that the maximum concentration has been reached, while a thick, creamy latex indicates a healthy condition of the bark.

Surface effects on the bark are also noted, since a fluid which kills, shrivels and blackens the outer cells is hardly desirable, whereas some fungicides appear to improve the condition of the outer cells and actually improve the renewal of bark.

It should be noted that cells near the cambium are far more sensitive to fungicides than cells further out in the cortex. Therefore the test for a fungicide to be applied to the panel after tapping should only penetrate lightly on wounds made close to the cambial region.

On the outer, hard bark most of the fungicides may be used at higher concentrations without danger to the liner bark.

The visual penetration four days after application of the fungicide should be not greater than one millimetre, preferably less than a half millimetre.

The tests are carried out under reasonable shade, as direct sunlight on the wounded bark may cause considerable damage which may be erroneously attributed to the fungicide. Dark mixtures particularly, appear to penetrate more deeply on bark in sunlight than they do under shade, owing to the heat absorbing properties of the black surface.

The use of mixtures of fungicidal coal-tar oils in an asphalt-kerosene medium on the tapping panel has been abandoned on account of the great absorption of heat on the black surface during wintering which follows so quickly on the rainy Mouldy Rot season.

Laboratory Tests.

Much useful work has been done by various research institutions throughout the world to find a satisfactory laboratory method of determining the fungicidal, bactericidal or germicidal value of a preparation. None has yet been considered very satisfactory. Though the Rideal-Walker test has found considerable popularity as a means of determining bactericidal value it does not follow that the product

treated will give the same efficacy when used upon living plant or animal material. Recently a compound of high "R.W." coefficient proved useless as a fungicide on rubber trees whereas one of comparatively low "R.W." coefficient proved very efficient in control of Mouldy Rot.

It has been found that, with cultures of the Mouldy Rot fungus *Ceratostomella fimbriata* in agar medium, the strength of say a tar-acid emulsion required to kill the fungus was so low compared with that required in the field that no indication could be obtained from such culture tests which would enable the value of a specific compound for the purpose of control of Mouldy Rot or indeed any other disease of the tapping panel to be judged. It could be considered as giving merely a comparison of the lethal efficiency of the various compounds in that medium.

An alternative laboratory method was investigated. This consists of inoculating clean strips of living bark 6 x 1 x $\frac{1}{4}$ inch in sterile tubes with the Mouldy Rot fungus *Ceratostomella fimbriata*. The fungus is grown on the cambial side of the bark strip for seven days, after which it is found that the thick-walled resting spores are present in great numbers. The strips of bark are then immersed in beakers containing various strengths of the fungicide under test. Scrapings of the fungus and tissue are then taken from the strips of bark at short intervals, usually after immersion for 2, 5, 10, 15, 20, 25 and 30 minutes, and the scrapings are washed and inoculated into a tube or plate of nutrient agar.

This time-immersion method gives results considerably more comparable to the field tests than the Rideal-Walker test, but is still so inferior to the field-test method that it has been decided that the field-test should be considered the only suitable final test of the efficacy of a fungicide for the control of the disease.

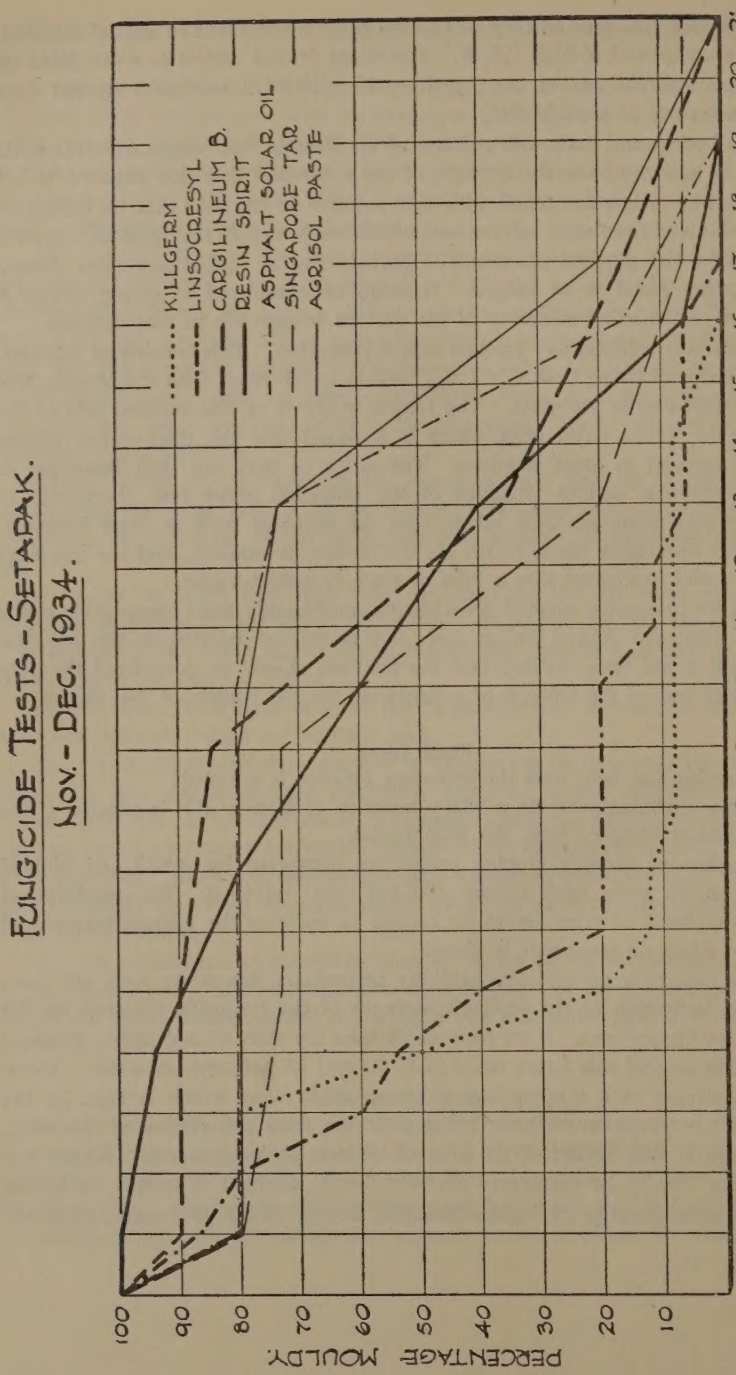
Field Tests.

In carrying out field tests the following practice is adopted:

An area of rubber carrying a heavy infection of Mouldy Rot is selected at the most convenient distance from the laboratories.

Trees showing mouldy tapping panels are numbered by stencil and divided into plots of 25 trees, each having 100 per cent. infection. The condition of neighbouring fields of trees serves as control to indicate the normal progress of the disease when no treatment is given.

In the case of a tar-acid emulsion the preliminary laboratory tests will have given some indication of the probable strength of the fungicide required for the field test, say 10 per cent. Four plots of 25 trees are then treated with a different concentration around this figure say 5, 7.5, 10 and 15 per cent. in water. Treatment by spraying each tapping day is given and a close watch is kept for the appearance of symptoms of bark burning or too deep penetration of the fluid, together with a daily record of the number of trees showing mould. Within two weeks it can usually be discovered that the lowest strength is useless for killing the fungus while possibly the highest strength, though killing the fungus within the


FUNGICIDE TESTS - SETAPAK.
NOV. - DEC. 1934.
PERCENTAGE MOULDY
DAYS.
KILLGERM
LINSOCRESYL
CARGILINEUM B.
RESIN SPIRIT
ASPHALT SOLAR OIL
SINGAPORE TAR
AGRISOL PASTE
0
10
20
30
40
50
60
70
80
90
100
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first few days, also shows signs of over-penetration and consequent bark burning. Thus the early field tests give the probable minimum strength required to kill the fungus and the maximum safe strength at which the fungicide can be applied to the bark without injury.

The plot receiving only a 5 per cent. strength of fungicide will then be treated with a 7.5 per cent. solution and the "15 per cent." plot will be treated with a 12.5 per cent. solution, while a further main plot of 100 trees will be treated as in estate practice with an average strength of fungicide, say in this case a 10 per cent. concentration, for one month, records being taken each day of the number of trees and condition of the renewing bark before, during and after the experiment.

During these tests no special effort is made to prevent infection from neighbouring, untreated trees, and each tapper may tap a number of treated and untreated trees at will so that the test is as thorough as possible.

When treatment is stopped, a note is usually made of the time required for the reappearance of mould on the treated trees.

Any preparation which fails to control the disease during a period of one month's treatment is considered as unsuitable for a place on the White List of fungicides for control of the disease.

On the other hand, fungicides which cause bark burning at or near the strength required for killing the mould are also regarded as unsuitable. In fact this has been the chief reason for rejection of many proprietary products.

As a point of interest, a record, published in the Annual Report of the Rubber Research Institute, 1934, p. 94, of an experiment to demonstrate the efficiency of the various types of fungicides used for the control of the disease in heavily-infected small-holdings rubber areas is given below. The materials used were Killgerm (a proprietary fungicide) and Linsocresyl (prepared in the Pathological Division), as representatives of the tar-acid emulsions; Cargilineum 'B' mixture and Agrisol Paste (both proprietary fungicides), as representatives of the greasy water-proof pastes; Singapore Tar and Asphalt-Solar Oil plus 10 per cent. Brunolinum, as representatives of the black water-proof paints which find a fairly wide use. A resin-spirit mixture in common use in the Netherlands Indies was also included but, during the wet weather was found seriously to damage the bark, although on the advent of dry weather early in December further application proved to have no ill-effects on the renewed bark. The results are given in tabular and graphical form. The initial degree of infection in each plot was 100 per cent. The condition of the renewed bark was noted weekly and the flow of latex was judged by pricking the renewing bark with a knife point. It has frequently been noticed that, if the fungicide has damaged the bark, even only slightly, the latex flow is poor and the latex produced is of a thin watery nature. The results indicate the superiority of the tar-acid emulsions.

Fungicide Tests, 1934.

Fungicide	Application	When clear of Disease	Condition of Bark	Latex
1. Killgerm 10 per cent. in water	Daily	After 16 paintings	Very good condition	Good
2. Linsocresyl 10 per cent. in water	Daily	After 17 paintings	Good condition	Good
3. Cargilineum applied neat	Every 4th day	After 6 paintings	Fair to good	Good
4. Resin Spirit applied neat	Every 3rd day	After 6 paintings	Hard crust formed. Bark damaged in wet weather. Renewal of bark good in dry weather.	Fair to good
5. Singapore Tar applied neat	Every 4th day	After 7 paintings	Burning where the bark is tapped deeply, otherwise good bark renewal.	Fair
6. Asphalt-Solar Oil applied neat	Every 3rd day	After 7 paintings	-do-	Fair to good
7. Agrisol Paste applied neat	Every 4th day	After 6 paintings.	-do-	Fair.

Guarantee.

A proprietor whose preparation gives satisfactory results in the above tests is required to give a guarantee that the composition and formula of the preparation will remain constant, and, should any alterations take place, he is required to notify the Director of Agriculture at once so that, if necessary, further tests can be made. If these conditions are complied with the preparation is gazetted by Government and placed on the official list of fungicides recommended for use in control of the disease.

Nomenclature.

In conclusion, a few words on the terminology used in this article may serve to clear up misunderstandings. In *Webster's International Dictionary* the following definitions of the words Fungicide, Antiseptic and Disinfectant may be found.

"Fungicide. (n)—Any substance which destroys fungi."

"Antiseptic. (n)—An antiseptic substance. That which may be used to destroy bacteria with little or no harmful effect on the living body."

"Disinfectant. (n)—A substance adopted for destroying the bacteria in, and rendering harmless and inoffensive, objects, places or materials containing putrefactive or pathogenic bacteria. A disinfectant differs from an antiseptic in not being intended for use upon the living body; hence many substances not applicable as antiseptics may serve as disinfectants or stronger solutions of antiseptic substances may be employed."

If, in the above definitions "rubber tree" is substituted for "the living body," the correct use of the above terms in plant therapeutics can better be understood.

In general, a substance used in low concentrations may be used as a fungicide, while the same substance in higher concentration becomes a disinfectant and plant destroyer. The margin between these two strengths may be regarded as the margin of safety and the greater this margin the safer the material is for use as a fungicide. This is of importance when it is remembered that, in wet weather, it is more difficult to control Mouldy Rot and there is a great tendency to use stronger fungicides; if there is only a small safety margin this is impossible without having considerable trouble from bark burning.

In the White List of fungicides given previously the normal strength for use of the fluid and the maximum strength which it is reasonably safe to use under abnormal conditions, *i.e.* during wet weather, are given.

Summary.

A brief history is given showing the points which led to the official testing of all substances used for the control of Mouldy Rot and the provision of an official list of fungicides for use for such purpose in Malaya.

A description is given of laboratory and field tests formulated for the purpose of testing these substances.

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VARIETAL AND MANURIAL TRIALS WITH DERRIS

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Introductory.

Attention was drawn in a previous paper (1) to the wide differences found in the amount of ether extract of *Derris elliptica* when cultivated at the Experimental Plantation, Kuala Lumpur, and at the Central Experiment Station, Serdang.

Results of analysis showed that while marketable roots of this species of Derris cultivated at Kuala Lumpur yielded an ether extract amounting to approximately 25 per cent. on a moisture-free basis, roots from plants of the same species and of the same age from Serdang yielded an ether extract of only about 10 per cent.

A suggestion was made that the difference might be accounted for by the lack of some particular nutrient, poor soil conditions, or unsuitable environment.

Experiments were therefore carried out to determine the variations in the amounts of the important plant nutrients for this species when cultivated both at Kuala Lumpur and at Serdang. Further, in view of the possibility of other species being similarly affected, the investigation was extended subsequently to include all the principal species of Derris established at both Stations.

Manurial trials have also been carried out with different species at Serdang to ascertain the extent to which the yield of root and its toxicity might be influenced as a result of the application of artificial fertilizers.

Exchanges of planting material between various Stations have also been effected to determine the extent of the variation in toxicity due to change of environment.

(A). REMOVAL OF PLANT NUTRIENTS.

The following species were included in the investigation:—

Species of Derris.	Location.
D. elliptica	Kuala Lumpur.
do.	Serdang.
D. elliptica, Sarawak creeping	Kuala Lumpur.
do. do.	Serdang.
D. malaccensis var. *sarawakensis*	Kuala Lumpur.
do. do.	Serdang.
D. malaccensis, tuba merah	Kuala Lumpur.

Collection and Analysis of Samples.

Sufficient plants were selected at random to yield not less than 20 lbs. of material. In the case of *D. elliptica,* Sarawak creeping, which yielded approximately 6 lbs. of material per plant, six plants only were selected.

The plants varied in age from 24 to 26 months, so that it may be assumed they had reached maturity.

The plants were removed complete with roots and the latter washed to remove adhering soil. Care was taken not to damage the cortex of the root during this operation.

Owing to the impossibility of direct sampling, the plants were separated into component parts before analysis, the proportions of these being also determined in order to allow the composition of the plants to be calculated.

The component parts selected were leaves, stems, and roots.

As regards the analysis of the components, determinations were made of moisture, carbon, nitrogen, phosphoric acid, potassium, calcium, and magnesium.

Owing to the large number of separate estimations involved, where possible, volumetric methods were substituted for the more laborious gravimetric processes.

Interpretation of Results of Analysis.

The results of analysis of the various components and the calculated composition of the plants are given in Table I. In order to make the table as concise as possible, only the average, maximum, and minimum figures are given.

The figures show no specific differences in the amounts of the principal plant nutrients in the various species. Variation is general, the widest differences occurring in the potassium and calcium contents. In this connexion it is interesting to note that in those cases in which the calcium content is low the potassium content is high and *vice-versa.* This distribution of potassium and calcium is not, however, a characteristic of the species; for example, in the case of *D. malaccensis* var. *sarawakensis* cultivated at Kuala Lumpur and Serdang the following results for the whole plant were obtained:—

Location		Potassium as K_2O per cent.	Calcium as CaO per cent.
Kuala Lumpur	...	0.20	0.48
Serdang	...	0.61	0.17

While it is realized that chemical analysis of a plant cannot be relied upon as an accurate guide to its requirements, either from the point of view of growth or of the development of some special characteristic, the results are of value as regards forming an estimate of the approximate amounts of plant nutrients removed when the crop is harvested.

These figures will vary both for the particular species and with the planting distance, while they are also dependent upon whether the stems of the plants are removed for propagating purposes or are returned to the land.

Table I.
Analysis of Component Parts and Calculated Composition of Plants.

(Results expressed in parts per cent.)

Details	Nutrient	Average	Maximum	Minimum
Leaf	Carbon ...	15.17	22.12	11.50
Proportion of leaf 19.8 per cent.	Nitrogen ...	0.97	1.38	0.76
	Phosphoric acid as P_2O_5	0.17	0.22	0.14
Average moisture content 64.0 per cent.	Potassium as K_2O ...	0.58	0.86	0.30
	Calcium as CaO ...	0.44	0.60	0.24
	Magnesium as MgO ...	0.08	0.10	0.05
Stem	Carbon ...	13.28	16.14	10.45
Proportion of stem 61.8 per cent.	Nitrogen ...	0.56	0.63	0.47
	Phosphoric acid as P_2O_5	0.15	0.18	0.12
Average moisture content 61.3 per cent.	Potassium as K_2O ...	0.40	0.60	0.16
	Calcium as CaO ...	0.36	0.51	0.15
	Magnesium as MgO ...	0.05	0.07	0.01
Root	Carbon ...	17.34	22.36	14.60
Proportion of root 18.4 per cent.	Nitrogen ...	0.53	0.70	0.41
	Phosphoric acid as P_2O_5	0.13	0.18	0.10
Average moisture content 55.3 per cent.	Potassium as K_2O ...	0.36	0.57	0.14
	Calcium as CaO ...	0.26	0.40	0.12
	Magnesium as MgO ...	0.04	0.06	0.03
Plant (calculated)	Carbon ...	14.40	18.47	11.42
Average moisture content 60.7 per cent.	Nitrogen ...	0.64	0.79	0.51
	Phosphoric acid as P_2O_5	0.15	0.18	0.12
	Potassium as K_2O ...	0.43	0.65	0.18
	Calcium as CaO ...	0.36	0.51	0.16
	Magnesium as MgO ...	0.05	0.07	0.02

Table II.
Limits of Amounts of Plant Nutrients removed per Acre per Crop.

(5,590 plants per acre)

Species of Derris	Nutrient	Average lbs.	Maximum lbs.	Minimum lbs.
D. elliptica	Carbon ...	1851.4	2374.7	1468.3
	Nitrogen ...	82.3	101.6	65.6
	Phosphoric acid as P_2O_5	19.3	23.1	15.4
	Potassium as K_2O ...	55.3	83.6	23.1
	Calcium as CaO ...	46.3	65.6	20.6
	Magnesium as MgO ...	6.4	9.0	2.6
D. elliptica, Sarawak creeping	Carbon ...	5151.7	6607.9	4085.7
	Nitrogen ...	229.0	282.6	182.5
	Phosphoric acid as P_2O_5	53.7	64.4	42.9
	Potassium as K_2O ...	153.8	232.5	64.4
	Calcium as CaO ...	128.8	182.5	57.2
	Magnesium as MgO ...	17.9	25.0	7.2
D. malaccensis var. *sarawakensis*	Carbon ...	2736.8	3510.4	2170.5
	Nitrogen ...	121.6	150.2	96.9
	Phosphoric acid as P_2O_5	28.5	34.2	22.8
	Potassium as K_2O ...	81.7	123.5	34.2
	Calcium as CaO ...	68.4	96.9	30.4
	Magnesium as MgO ...	9.5	13.3	3.8
D. malaccensis, tuba merah	Carbon ...	1609.9	2065.0	1276.8
	Nitrogen ...	71.6	88.3	57.0
	Phosphoric acid as P_2O_5	16.8	20.1	13.4
	Potassium as K_2O ...	48.1	72.7	20.1
	Calcium as CaO ...	40.3	57.0	17.9
	Magnesium as MgO ...	5.6	7.8	2.3

While, therefore, no definite figures can be given, an estimate of the total amount of plant nutrients involved for each of the four species is given in Table II. These figures are based on the results of analysis in Table I, together with the following additional data:—

Planting distance	8 ft. x 8 ft. (triangular)
No. of plants per acre	5590
Average weight of plants:	
D. elliptica	2.3 lbs.
D. elliptica, Sarawak creeping	6.4 ,,
D. malaccensis var. *sarawakensis*	3.4 ,,
D. malaccensis, tuba merah	2.0 ,,

The figures in Table II show that considerable amounts of plant nutrients, particularly in the case of *D. elliptica*, Sarawak creeping, are likely to be removed in the course of cultivation and point therefore to the necessity for manuring, if the land is kept continuously under cultivation with this crop.

(B). MANURIAL EXPERIMENT.

As far as can be ascertained no systematic manurial trials have been undertaken previously with this crop when cultivated under estate conditions. An exploratory investigation was therefore carried out in which for convenience the sub-plots were arranged systematically and not randomized.

The objects of the experiment were to ascertain the effects of the addition of artificial fertilizers on (*a*) yields of roots of different species, (*b*) ether extracts and rotenone contents of these roots with varying age, and (*c*) to indicate profitable lines of future and more exact work.

Lay-Out of Experimental Plots.

Care was taken to select land which had been cultivated previously with another crop, thereby ensuring that the effect of the manurial treatment would not be masked by a high natural fertility factor.

The soil belonged to the Hill Quartzite type and may be described as a yellow to dark sandy loam in which the fine fractions vary from 40 to 50 per cent.

As regards previous cultivation, the area selected formed part of a block planted originally with candlenut, *Aleurites moluccana*. This crop was, however, subject to attacks of die-back and termites, necessitating its removal.

Five species of Derris were selected for the experiment as follows:—

(*a*) *Derris polyantha*?*
(*b*) *Derris elliptica* (Singapore type).
(*c*) *Derris elliptica*, Sarawak creeping.
(*d*) *Derris elliptica* (Serdang type).
(*e*) *Derris malaccensis* var. *sarawakensis*.

As regards *D. elliptica*, there was insufficient planting material of the Kuala Lumpur type available; a supply of cuttings of this species was therefore

* The botanical identification of this species must be regarded as doubtful.

obtained from Changi, Singapore. Reference to the paper previously mentioned (1) will show that roots of this species from Singapore compared favourably as regards both ether extract and rotenone content with those from Kuala Lumpur.

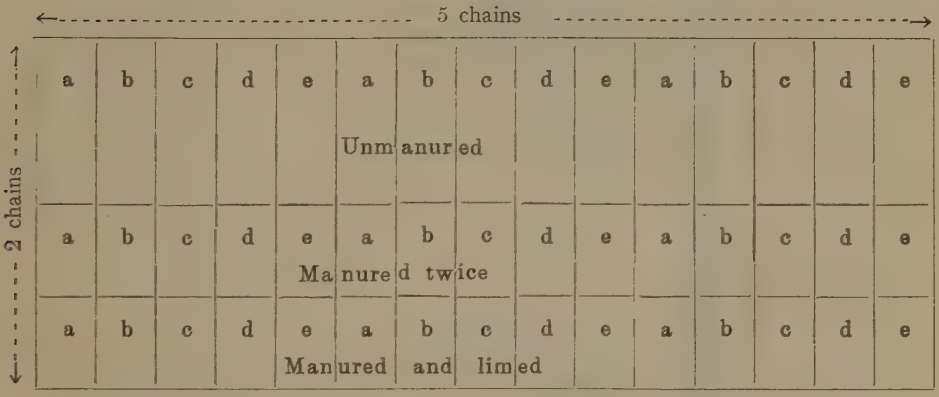
These five species were planted in November 1932 in an acre plot divided into 15 sub-plots, which allowed of each species being replicated three times.

Plants were established from stem cuttings and were spaced 3 ft. x 3 ft. triangularly, equivalent to 5,590 plants per acre.

The ultimate arrangement of the sub-plots is shown in Diagram I.

Diagram I.

Arrangement of Sub-plots in Manurial Experiment with Derris.



Notes: 1. Sub-plots marked with letters were planted as follows:
(a) *Derris polyantha*?
(b) *Derris elliptica* (Singapore type).
(c) *Derris elliptica*, Sarawak creeping.
(d) *Derris elliptica* (Serdang type).
(e) *Derris malaccensis* var. *sarawakensis*.

2. The area of each unmanured sub-plot amounts to 1/30th acre; the area of each sub-plot, either manured twice or manured and limed, is 1/60th acre.

Manurial Treatment.

One month after planting, the manurial dressing, consisting of the following fertilizers, was supplied:—

Details of Manure.		Rate of Application lbs. per acre.
Calcium cyanamide	...	280 (53 lbs. N).
Basic slag	...	336 (54 lbs. P_2O_5).
Sulphate of potash	...	84 (40 lbs. K_2O).

Table III.

Average Number of Plants Harvested per Sub-plot with Average Weight of Air-dry Marketable Roots per Plant.

Species of Derris	Control Area of sub-plot 1/30th acre No. of plants per sub-plot 186.		Manured Twice Area of sub-plot 1/60th acre No. of plants per sub-plot 93.		Manured and Limed Area of sub-plot 1/60th acre No. of plants per sub-plot 93.	
	No. of plants harvested	Weight of air-dry marketable roots per plant.	No. of plants harvested	Weight of air-dry marketable roots per plant.	No. of plants harvested	Weight of air-dry marketable roots per plant
		ozs.		ozs.		ozs.
Derris polyantha?	55	0.67	25	2.03	27	2.56
Derris elliptica (Singapore type)	27	0.21	10	0.27	10	0.27
Derris elliptica, Sarawak creeping	68	3.87	38	2.83	36	4.85
Derris elliptica (Serdang type)	110	1.23	55	2.14	57	2.16
Derris malaccensis var. *sarawakensis* ...	138	0.62	74	1.54	77	1.28

Note:—In order to obtain the average number of plants per sub-plot that would have been harvested, assuming that no plants had been reserved for chemical analysis, the individual figures should be increased by 7, this being the nearest integer to 6 2/3, 20 plants in all having been reserved from the three replications of each treatment.

The soil was forked lightly when the manures were applied. After manuring, the sub-plots received no further treatment beyond periodic weeding.

Difficulty was experienced in establishing the cuttings and subsequent growth was poor, the appearance of the manured and of the control sub-plots showing no apparent difference after one year's growth. Accordingly, in October 1933, the manured sub-plots were sub-divided, one half receiving a second dressing of artificials at the same rate as that previously applied, the other a dressing of slaked lime at the rate of 6 cwts. per acre.

After a further two months both series of the double-treated sub-plots had improved considerably in appearance, although in no case was there vigorous growth.

Twenty-four months after planting in the field, samples, consisting of all the roots from 10 plants selected at random from the above replications of each species and treatment, making 15 samples in all, were taken for analysis. The results of analysis will be discussed later.

The main crop was harvested when the plants were approximately 26 months old, except for 10 plants of each species which were left for a further four months to provide roots for analysis from plants 30 months old.

Yield of Root.

The figures for the yields of root from the different species with varying manurial treatments are given in Tables III and IV.

Table IV.

Average Weights of Air-dry Marketable Root Harvested per Sub-plot (1/60th acre).

Species of Derris	Control	Manured Twice	Manured and Limed	Variety Means
	lbs.	lbs.	lbs.	lbs.
Derris polyantha ? ...	1.16	3.34	4.33	2.94
Derris elliptica (Singapore type) ...	0.18	0.16	0.18	0.17
Derris elliptica, Sarawak creeping	8.05	6.72	10.89	8.55
Derris elliptica (Serdang type) ...	4.21	7.35	7.72	6.43
Derris malaccensis var. *sarawakensis* ...	2.70	7.08	6.15	5.31
				General Mean
Manurial Means ...	3.26	4.93	5.85	4.68

Note:—The average weights of root per sub-plot that would have been harvested, assuming that no plants had been reserved for chemical analysis, can be calculated from the results given in Table III.

Only the weights of the marketable or "fine" roots—that is, roots of a diameter half-an-inch or less—have been included; "coarse" roots—those greater than half-an-inch in diameter—being neglected.

To make the tables as concise as possible, only the average weights of air-dry "fine" roots per plant and per sub-plot for the three replications are given.

As regards the amount of marketable root per plant the results in Table III indicate that the highest yield is obtained with *Derris elliptica*, Sarawak creeping, the lowest with *D. elliptica* (Singapore type). It is possible that the latter species is unsuited to the comparatively heavy soil on which the experiment was carried out.

In the case of Table IV, the figures for the weights of roots for the control sub-plots have been halved in order to make them directly comparable with those for the sub-plots receiving manurial treatment.

Although, strictly speaking, statistical methods are inapplicable owing to the systematic arrangement of the sub-plots, the results in Table IV have been statistically examined for the purpose of a preliminary exploration, and show that there is no significant interaction between species of Derris and manures.

The following are the calculated significant differences in terms both of the general mean and of percentage of the general mean for (*a*) varieties (*b*) manurial treatment and (*c*) manures and control.

(*a*) 2.28 lbs. or 48.7 per cent.
(*b*) 1.74 lbs. or 38.2 per cent.
(*c*) 1.37 lbs. or 29.3 per cent.

From a consideration of these figures it appears that *Derris elliptica*, Sarawak creeping, *D. elliptica* (Serdang type) and *D. malaccensis* var. *sarawakensis* are significantly better than *D. polyantha*? and *D. elliptica* (Singapore type), while *D. elliptica*, Sarawak creeping, is significant over *D. malaccensis* var. *sarawakensis*.

The yields from the manured and limed sub-plots are significantly better than those from the controls.

Effect of Manurial Treatment on Toxicity.

The roots from the plants selected for analysis were washed free from adhering soil, dried and separated into "coarse" and "fine" roots.

In all cases analysis was restricted to the "fine" or marketable roots.

The methods used for the determination of ether extract and rotenone were those described in (2).

The results of analysis of roots from the different species with varying manurial treatments and at different ages are shown in Table V. To make the table as concise as possible only the figures, calculated on a moisture-free basis, are given.

The figures for roots from plants 24 months old are irregular and indicate no definite relationship between toxicity and manurial treatment. Apart from *Derris*

Table V.

Results of Analysis of Roots of Varying Age with Different Manurial Treatment.

(Moisture free basis)

Details of Sample	24 months old		30 months old	
	Ether Extract	Rotenone	Ether Extract	Rotenone
	per cent.	per cent.	per cent.	per cent.
Derris polyantha ? ...				
Control ...	10.65	2.90		
Manured twice ...	9.99	2.74	11.89	2.70
Manured and limed ...	10.73	2.72		
Derris elliptica (Singapore type)				
Control ...	20.76	6.56		
Manured twice ...	20.36	6.85	23.15	8.91
Manured and limed ...	22.09	6.71		
Derris elliptica, Sarawak creeping				
Control ...	17.97	3.92		
Manured twice ...	20.42	5.35	22.43	6.03
Manured and limed ...	18.70	5.28		
Derris elliptica (Serdang type)				
Control ...	10.05	2.29	6.88	0.99
Manured twice ...	4.78	1.14	9.73	1.78
Manured and limed ...	5.07	0.87	10.11	1.90
Derris malaccensis var. *sarawakensis*				
Control ...	19.72	2.45	20.16	3.22
Manured twice ...	18.85	2.37	23.67	2.94
Manured and limed ...	16.41	1.95	23.87	2.56

elliptica (Serdang type), the relatively small variations in ether extract are only of the order expected when dealing with roots from a mixed stock of cuttings.

While the variations between the three samples of roots of *D. elliptica* (Serdang type) would at first sight appear to be inexplicable, recent work carried out on the variation between the toxicities of roots from individual plants of this species has shown that such differences may be expected, bearing in mind also that the samples of root were drawn from a relatively small number of individual plants.

Similarly for roots from manured plants 30 months old, although the results indicate in every case a definite increase in toxicity compared with roots from plants 24 months old, it is doubtful whether the increase is real or apparent. In the former case the increase could be attributed to the natural development of the plants, in the latter case to a fortuitous selection of plants for analysis.

Details regarding the range of variation in toxicity between the root systems of individual plants from the various species under discussion will be given in a paper shortly to be published on this subject.

General Considerations on Yield and Toxicity.

Combining the results for yields of root and toxicity the figures indicate clearly the possibilities of *Derris elliptica*, Sarawak creeping, as a species likely to be successful under estate conditions and to meet the present market requirements in respect of both ether extract or rotenone. The present standards may be taken as 18 per cent. ether extract, rotenone 4 or 5 per cent., calculated on the roots as delivered. A higher price is paid for roots sold on a rotenone basis than on an ether extract basis.

Apart from the question of yields under the conditions of the present experiment, the figures also show that *D. elliptica* (Singapore type) has the highest combined toxicity, while *D. malaccensis* var. *sarawakensis* has possibilities as regards complying with the market requirements for a root sold on a basis of ether extract.

Neither *D. elliptica* (Serdang type) nor *D. polyantha*? can meet the market requirements in respect of toxicity and therefore the cultivation of these species can be neglected.

(C). VARIATION IN TOXICITY WITH CHANGE OF ENVIRONMENT.

The variations found in toxicity between different types of the same species of Derris, for example, *D. elliptica* (Singapore type) and *D. elliptica* (Serdang type), have raised the question of the chances of the roots of a particular species remaining constant in composition when cultivated under varying conditions.

As indicated previously such an investigation is preferably carried out with planting material derived from the same parent plant in order to eliminate the variations existing between roots from individual plants. As far as the writers are aware no records of work on these lines have been published.

As a result, however, of transfers of planting material a certain amount of information has gradually accumulated regarding the toxic contents of roots from plants of differents species when grown in various parts of Malaya.

A stock of cuttings of *Derris elliptica* (Singapore type) was received from an estate near the boundary of Negri Sembilan and Johore, the original planting material having been obtained from Changi, Singapore.

The soil at Changi is very sandy; that on the estate in question may be described as a clay loam.

A sample of root from this same stock was analysed with the following results, the plants being approximately 29 months old.

	Moisture-free basis per cent.
Rotenone	8.13
Ether extract	29.12

Cuttings from the plants were established in Kuala Lumpur on a soil of the Hill Quartzite type and which may be described as a sandy clay loam.

Roots from the plants were analysed when 25 months old and 32 months old respectively. The results of analysis are shown below, the figures in both cases being calculated on a moisture-free basis.

Age of Plants	Rotenone per cent.	Ether Extract per cent.
25 months	6.99	19.73
32 months	6.50	23.47

Allowing, therefore, for the mixed stock of planting material and variations in age, it is claimed that there are grounds for assuming that toxicity of root is not affected to a marked extent as a result of change of environment.

Additional evidence in support of this claim is found in the results of analysis of this type of *D. elliptica* quoted earlier in this paper in connexion with the manurial experiments. In that case the cuttings were despatched direct to Serdang from Singapore. Soil conditions were again different in both places.

Further, the results of analysis of roots from plants 24 months old grown in Brunei on a heavy clay soil from cuttings obtained from Changi have shown the high quality of the root to be maintained as the following figures show:—

	Moisture-free basis per cent.
Rotenone	8.33
Ether extract	26.33

D. elliptica (Serdang type) has been grown both at Serdang and at Kuala Lumpur. The soil at Serdang belongs to the Valley Quartzite type and may be described as a yellow to grey loam; that at Kuala Lumpur belongs to the Hill Quartzite type and may be described as a sandy clay loam.

The results of analysis were as follows; in all cases the figures have been calculated on a moisture-free basis.

Location and Age		Rotenone per cent.	Ether Extract per cent.
Kuala Lumpur, 25 months	...	1.85	9.40
Serdang, 26 months	...	3.10	12.72
Kuala Lumpur, 32 months	...	1.88	8.69
Serdang, 33 months	...	1.03	6.55

A poor quality of root appears to be an inherent characteristic of this type of *D. elliptica* irrespective of a change of environment.

D. polyantha? has also been grown alongside *D. elliptica* (Serdang type) both at Serdang and at Kuala Lumpur with the following results: in both cases the figures have been calculated on a moisture-free basis:—

Location and Age		Rotenone per cent.	Ether Extract per cent.
Kuala Lumpur, 25 months	...	2.97	9.70
Serdang, 24 months	...	2.90	10.65

While, therefore, it seems reasonable to assume that toxicity is not affected to any marked extent as a result of change of environment, the variations in toxicity between individual plants necessitate the greatest care being taken in the selection of material for planting purposes. Cuttings should be taken from a wide range of plants, while it would also be an advantage to know the toxicity of the roots of the stock in question as a result of the analysis of an average sample.

Summary of Experimental Work.

As a result of the various experiments the following observations are offered:—

1. Results of analysis indicate no specific differences in the amounts of the principal plant nutrients in the various species of Derris examined.

2. Calculations show that considerable amounts of plant nutrients are likely to be removed in the course of cultivation of Derris and point to the necessity for manuring the land.

3. An exploratory manurial experiment with five different species of Derris is described. The main objects of the experiment were to ascertain the effects of the addition of artificial fertilizers on (*a*) yields of roots of different species, and (*b*) amounts of ether extract and rotenone in roots of varying ages.

4. The figures for the yields of roots were statistically examined and show no significant interaction between species of Derris and manures.

5. The yields from the manured and limed sub-plots were significantly better than those from the controls.

6. The results of analysis of the roots are irregular and indicate no definite relationship between toxic content and manurial treatment. It is uncertain to

what extent the figures were influenced by the variations known to exist between the toxic contents of roots from individual plants.

7. Combining the results for yields of root and toxic content the figures indicate the possibility of *Derris elliptica,* Sarawak creeping, as a species suitable for estate cultivation.

8. An account of transfers of planting material of different species between different parts of Malaya is given together with the corresponding results of analysis for roots at different ages. As a result it seems reasonable to assume that toxicity is not affected to any marked extent as a result of change of environment.

Acknowledgment

The writers wish to acknowledge the assistance rendered by Mr. J. H. Dennett, Soils Chemist, in the statistical examination of the figures for the yields in the manurial experiment.

References.

(1) Georgi, C. D. V. and Gunn Lay Teik. The Rotenone Content of Malayan Tuba Root. *Malayan Agricultural Journal,* Vol. XX, No. 10, October 1932, page 498.

(2) Georgi, C. D. V. and Gunn Lay Teik. The Valuation of Tuba Root. Special Bulletin, Scientific Series No. 12, 1933.

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THE EFFECT OF IRRIGATION OF PADI WITH SALT WATER

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In view of the large number of new padi areas being opened up or being considered for opening up and their frequent proximity to the sea, with the possibility of contamination of irrigation water with sea water, at least in the early stages, it was considered advisable to make some exploratory trials, in pots, of irrigating a local variety of padi with salt water of different strengths, to obtain some idea of the amount of salt which padi can withstand.

For this purpose a Nachin variety of padi (F.S. 27) was planted two plants per pot on soils derived from the following areas:—Malacca, Kamunting (reslimed mining land), Titi Serong, Selinsing, Lenggong (high-yielding area), Kuala Pilah (typical granite padi land), Penang, Raub (normal), Raub (high-yielding).

Each of these soils was irrigated with water containing 20.0, 2.0 and 0.2 per cent. of sodium chloride.

(*a*) *Sodium Chloride (20.0 per cent.).*

Only in the case of the richest soil (Penang) was padi able to survive until harvest and even then the amount of grain was negligible. Growth was fairly good for the first month followed by rapid deterioration. By the end of the third month all plants had died except those planted on Raub (high-yielding), Penang and Titi Serong soils. By the end of the fourth month only padi on Penang soil survived.

(*b*) *Sodium Chloride (2.0 per cent.).*

Up to the end of the second month growth was generally good with the exception of the plants on Kuala Pilah soil (the poorest soil used), but during the third month all were sickly except those on Penang and Lenggong soils; by the beginning of the fourth month the padi on Titi Serong soil was dying. All yielded grain except those grown on Malacca and Titi Serong soils.

(*c*) *Sodium Chloride (0.2 per cent.).*

It would appear that this concentration of salt had little or no effect on general growth. All yielded grain except when planted in Raub (normal) soil and in view of the fact that this soil gave a yield with the 2.0 per cent. salt it must be concluded that the lack of yield was due to other causes.

In weight there was not a great deal of difference between the 2.0 and the 0.2 per cent. series of experiments. The mean yield was slightly higher for the former concentration.

General appearance of the plants in the 2.0 per cent. series was, however, not so good as in the 0.2 per cent. series and, as a general inference, it would

seem that padi is not likely to withstand much over 2.0 per cent. concentration of salt for a lengthy period. The soils used were quite fresh and therefore were probably not greatly affected by the brackishness at first, but a second season would probably intensify growth differences and subsequently affect yields.

Unfortunately owing to the writer being on long leave it was not possible to undertake a subsequent examination of the soil for amount of chlorides absorbed.

The figure of 20 per cent. is of the same order as the Dead Sea. The percentage of salt in ocean water is between 3.5 and 5.0 per cent.

Received for publication 15th April 1936.

Abstract.

TWENTY-FIFTH REPORT ON NATIVE RUBBER CULTIVATION IN THE NETHERLANDS INDIES.

*Fourth Quarter 1935, with additional data up to the end of February 1936.**

Prices.

The fourth quarter of 1935 opened with a quotation for Java standard sheet in Batavia of 18 guilder-cents per half kilogram. A steady improvement then set in till, on October 26th, a price of 20 cents was reached. The advance was the result of several causes, amongst which may be mentioned the reduction in stocks held in England and Malaya and the satisfactory consumption figures of the United States of America. Moreover, the market was favourably influenced by the action of the Netherlands Indian Government in taking up approximately 20,000 tons of licenses previously issued to estates, in an effort to compensate for the exports of native-grown rubber in excess of the quota that had been assigned to it. Finally it became apparent from the rapidly successive increases in the extraordinary export duty levied on the native-grown product that everything possible was being done to make the restriction in that direction as effective as possible.

The price level of 20 guilder-cents per half kilogram was maintained throughout the quarter, except for a brief reaction on December 4th, following the announcement of the decision of the International Rubber Committee to raise the basic quota of the Netherlands Indies for the years 1936, 1937 and 1938 by 57,000 tons, 53,000 tons and 55,000 tons respectively, and of the retention of the restriction percentage for the first half of 1936 at 40 per cent. It was soon realized, however, that the quota revision for the Netherlands Indies meant in actual fact a strengthening of the restriction system and in December 7th the price again reached 20 cents.

The half-monthly averages of the daily quotations for Java standard sheet in Batavia for the fourth quarter were 18.3, 19.6, 20.1, 19.8, 19.6 and 19.9 guilder-cents per half kilogram. The half-monthly averages in January 1936 were 19.8 and 21.0; and for February 21.8 and 22.5.

The extraordinary export duty on native-grown rubber was raised from 14½ cents to 16 cents per half kilogram on February 12th, and on February 20th to 16½ cents. These increases were made to compensate for the price advance which stimulated production.

In the second half of October, medium blanket was quoted at an average of 6 per cent. lower than standard sheet, but in the second half of December this margin fell to 3½ per cent., and since about the middle of January it has not been more than about 1½ per cent.

Production and Exports.

The following table shews the monthly production and exports of native-grown rubber during 1935.

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* Abstract from *The Netherlands Indies*, Vol. IV, No. 8. April 16th, 1936.

Table 1.

Production and Exports of Native-Grown Rubber in 1935.
(In Metric Tons)

Month 1935	Total Exports	Changes in Stocks Held	"Corrected" Production
January ...	9,865	— 3,378	6,487
February ...	17,179	— 5,260	11,919
March ...	9,042	+ 1,536	10,578
April ...	13,809	— 675	13,134
May ...	22,628	— 3,481	19,147
June ...	14,576	— 1,470	13,106
July ...	8,227	+ 1,290	9,517
August ...	9,870	+ 1,255	11,125
September ...	9,763	+ 947	10,710
October ...	17,806	— 3,400	14,406
November ...	9,260	+ 37	9,297
December ...	2,866	+ 1,746	4,612
TOTAL ...	144,891		134,033

In Table 2 are given the actual and the allotted exports of native-grown rubber in the first two restriction years.

Through the buying back of 19,667 tons of licences that had been issued to estates, the excess for 1934/35 was reduced to 19,038 tons.

Types of Rubber Exported.

The share taken by dry rubber in the total exports of native-grown rubber is constantly increasing. In the first half of 1934, only 15½ per cent. of the exports of this class of rubber were shipped as dry rubber; the percentage rose, however, to 85.4 in the quarter under review.

The exports from the Western Division of Borneo, Tapanuli, Banka, and the Rhio Free Area consisted in the last half of 1935 almost entirely of dry rubber. Wet rubber exports from ports in Sumatra West Coast and Acheen were insignificant, but Palembang, Bangkalis, the Southern and Eastern Division of Borneo, and Rhio Indragiri were still exporting quite large quantities of wet rubber

as the following figures shew:—Palembang 5,148 tons, Bengkalis 2,922 tons, S. and E. Borneo 1,926, and Rhio Indragiri 1,254 tons, exported wet.

The trend of quarterly exports of native rubber is given in Table 3.

Table 2.

Exports of Native-Grown Rubber in the First and Second Years of Restriction.

(In Metric Tons)

	June to December 1934	January to December 1935
Balance from previous year	—	8,450
Shipments during period in question	83,985	144,592
Placed under customs control at end of period ...	258	30
Exports to be charged against restriction quota ...	84,243	153,072
Quota allotted	75,793	114,367
Amount by which quota was exceeded	8,450	38,705

Table 3.

Quarterly Exports of Native-Grown Rubber.

(In Metric Tons, Dry Equivalent)

Quarter	Group 1a Blankets	Group 1b Dry native Sheets	Group 11a Scrap	Group 11b Wet Cake	Percentage of the total shewn by	
					1a + 1b	11a + 11b
1934 1st	7,878		1,090	41,740	15.5	84.5
2nd	13,823		1,972	51,619	20.5	79.5
3rd	17,198		1,658	21,537	39.7	60.3
4th	4,577	5,138	123	12,808	42.3	57.7
1935 1st	8,299	7,924	953	18,863	45.2	54.8
2nd	13,851	15,508	1,009	20,646	57.7	42.3
3rd	10,230	9,514	19	8,097	70.9	29.1
4th	13.104	12,452	16	4,361	85.4	14.6

Individual Restriction Scheme.

The registration of rubber plantations preparatory to the general introduction of a system of individual restriction is progressing in a satisfactory manner. In the quarter under review the preliminary experimental registrations (comprising two Sub-divisions of each of the Departments of Palembang, South and East Borneo, West Borneo and Sumatra's East Coast) were completed and the general registration of all plantations was begun. The data of the registration at present available do not permit even a rough estimate of the results that may be expected. The complete data of the registration and the test tappings made coincidentally will only be available in the course of the second half of this year. The progress of the work justifies the expectation that the individual restriction scheme could be applied to the whole of the Netherlands Indies as from January 1st, 1937.

Review.

Cultivated Crop Plants of the British Empire and the Anglo-Egyptian Sudan (Tropical and Sub-Tropical).

H. C. Sampson, C.I.E., B.Sc., F.L.S., *251 pages. Royal Botanic Gardens, Kew. Bulletin of Miscellaneous Information: Additional Series XII. London, H.M. Stationery Office, 1936. Price 6 shillings 6 pence.*

This bulletin is referred to in the introduction as an Inventory of Cultivated Crop Plants grown in all tropical and sub-tropical countries of the British Empire and Anglo-Egyptian Sudan. Its publication was proposed at the Conference of Colonial Directors of Agriculture held in 1931, and is based on the replies to a questionnaire issued by the Director of the Royal Botanic Gardens, Kew. Upon receipt of answers to the questionnaire from the various Departments of Agriculture concerned, the inventory was compiled by Mr. H. C. Sampson, Economic Botanist at Kew. The assistance of several specialists is acknowledged, including the staff of the Herbarium, Royal Botanic Gardens, Kew, who checked the names and authorities for the species included. The book serves a useful purpose in providing, in a concise form, information detailing the distribution of tropical and sub-tropical crop plants in the British Empire. This will prove of considerable value to agricultural officers who are concerned in the introduction of crop plants, especially of food crops and fruits to which the limitations of saturated markets for money crops do not apply.

The plant genera are arranged alphabetically and the species placed similarly in each genus. Mr. Sampson states that every effort has been made to give the correct name by which the species cited should be known. Agricultural officers in the tropics will appreciate this as, during the past few years, many changes in nomenclature have occurred. An appendix lists a number of common synonyms with reference to the name adopted in the text. No index of common or local names is provided but the index to commonly-used synonyms serves as a guide where changes in nomenclature have been adopted. Under each specific name is grouped the following information, (i) presumed country or countries of origin, (ii) common and vernacular name or names together with the country, or language employed, (iii) uses, (iv) countries in the British Empire where the crop is grown. The latter information is amplified under five headings, arranged in the crop's relative order of importance. This is briefly as follows:—(a) indigenous or early introduction, (b) successfully established, (c) still under trial, (d) introduced but cultivation abandoned, (e) introduced but failed to become established.

It is inevitable that in a compilation of this nature, inequalities in the relative importance of many crop plants will result. It is not, however, proposed to criticise the inventory in this review. Omissions and inequalities in respect of Malayan crop and economic plants occur but there should be little difficulty in

correcting these in a subsequent edition of the book, and arrangements that will provide for revision are proposed. The present bulletin will do much to stimulate interest in the geographical distribution of tropical and sub-tropical crops and enable the agricultural officer to obtain an idea of the climatic requirements of any particular crop. The use of the abbreviations S.S. and F.M.S. is not satisfactory; Malaya is the correct name for the peninsula, which in addition to the Straits Settlements and Federated Malay States includes several unfederated States. As an example it is stated (page 74) that *Elaeis guineensis*, the oil palm, is successfully introduced into the S. S. and F. M. S., whereas returns show that there is no planted area in the Straits Settlements. The total area of oil palms in Malaya is 65,000 acres, made up by 33,000 acres in the F.M.S., and 32,000 acres in the Unfederated Malay States, practically all of which is in the State of Johore.

The latter part of the book contains a series of notes on a variety of crops, principally staple food plants of the indigenous peoples of the Empire. The notes will serve as a useful guide in connexion with the comparative study of crop varieties. Twenty crops are included and at the end of each note a short bibliography refers to important literature dealing with the crop described. It is hoped that the scope of this section of the book will be extended in a further edition.

Mr. Sampson and his collaborators are to be congratulated on the production of this book, which again serves to remind those concerned in tropical agriculture, of the great assistance which the Royal Botanic Gardens, Kew, has always been so ready to provide.

J. N. M.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports by Agricultural Officers.

May, 1936.

The Weather.

The rainfall for May was heavier than usual for the month in most parts of Malaya, and heavy thunderstorms were experienced in Penang, the inland areas of Perak, Selangor and Pahang and in Kelantan. The flooding of roads occurred in parts of Perak and Selangor and of padi lands elsewhere, including parts of Pahang and Johore.

Exceptions to the general wet conditions were the coastal belt of Selangor as far north as Kuala Selangor and the east coast of Pahang, whilst in Malacca dull cloudy days and a normal rainfall prevailed. In a belt of country from Lumut to Kuala Kangsar in Perak, fairly dry conditions prevailed, but the Negri Sembilan coast and the Lower Perak coastal area appear to have shared in the somewhat heavier rainfall that was generally characteristic.

Remarks on Crops.

Padi.—The transplanting of seedlings commenced in the early areas of Batang Padang District of Perak, in the inland Districts of Selangor, the riverine mukims and Bentong District of Pahang and in the Kukup and Segamat Districts of Johore. Flood damage to planted padi is reported from the last named District and from the Samantan valley in Pahang, whilst planting has been impeded by floods in areas in Pahang and Johore. Preliminary ploughing has commenced in Kedah and Malacca and has made good progress on the dry-padi areas of Kelantan.

The efforts that have been made in Pahang to interest cultivators in cultivation of the land with the *tajak* are reported to be meeting with a certain degree of response in the river mukims of Lipis District.

In Stage II of the Sungei Manik area considerable progress is reported to have taken place in felling and clearing lands newly alienated, although the rate of progress and thoroughness of work varies with the origin of the Malays who occupy the land and with the Ketua in charge. Thus, on one portion occupied by Kuala Kangsar Malays and another occupied by Banjarese, progress is slower than on the remainder of the area, where it is anticipated that the felled jungle will be in a condition for burning by the specified date. The fact that such good progress has been made in clearing the jungle in readiness for planting in the coming season speaks well for the sound work done by the Colonization Officer and others, for it is the normal custom of the country to extend the clearing of timber over several seasons, the crop in the meantime suffering from the amount of felled

timber lying in the fields. On Stage I considerable progress has been made in the making of division bunds between lots and between the padi land and drains.

In the Panchang Bedena area felling and clearing was continued on some 5,000 acres. On other parts the making of bunds is being impeded by the amount of felled timber present on the land and by wet weather.

Rubber.—There was a slight decline in price for all grades at the beginning of the month, but a recovery towards the end of the month. A curious feature of this month's reports is an increase in price offered for uncouponed rubber in certain areas although there has been a general decline in the price for coupons. Thus, in south Perak uncouponed rubber realized $9.50 a picul, in Negri Sembilan the rise in price noted last month for uncouponed rubber was maintained, whilst in south Johore uncouponed rubber rose to $9 to $10 and was maintained at last month's price of $9 in north Johore. In Kedah there was a brisk demand for unsmoked rubber and a revival of a demand for scrap, which realized as much as $25 a picul.

Further activity in the erection of smoking cabinets is reported from Batang Padang in Perak, where four others are under construction, from Temerloh, where two new ones have been erected, whilst progress continues in Central Johore. Isolated cases are reported where cultivators have obtained sufficiently enhanced prices for good smoked sheet to make the work of smoking well worth while but, in general, the difficulty of obtaining from local dealers a fair price for the improved article is retarding any general adoption of smoking by small-holders.

In Pahang an arrangement was made with dealers some time ago to exhibit samples of various grades of rubber and the price offered for each. Reports to hand indicate that this is having a definite effect on improving the product offered for sale by many small-holders.

Copra.—Further investigation into particulars of the competition in Province Wellesley between kiln owners and buyers for the fresh nut trade has shown that the demand for the latter is variable and increases during or just before the third, sixth and ninth months of the Chinese year. During the month reviewed the variation in price for fresh nuts in the north of the Settlement was as great as $8.50 per 1,000 with a maximum of $22 and a minimum of $13.50, the higher prices obtaining in areas where buyers for fresh nuts were operating. Such kilns as were working did not turn out high-grade copra, but dried for one or two days only, it being claimed that the quicker turnover was more profitable than the premium obtained for a high-grade product with smaller turnover. Investigation is proceeding to ascertain if the establishment of twin cabinet kilns will be likely to improve the position.

In the Bagan Datoh area of Perak further demonstrations were given with the twin cabinet kiln erected for the purpose. One of this type has been erected by small-holders and commenced work and it seems probable that further kilns will be similarly erected in course of time. It is worthy of note that the few improved kilns of the Ceylon type that have been built in the Bagan Datoh area have

continued to produce four-day copra of good quality and one further brick kiln of this type was erected during the month.

In Selangor, a further decline in copra price is reported in Kuala Selangor but the price was maintained in Kuala Langat and Klang. It is recorded in the monthly report that the Klang copra is sold either to an estate or direct to shippers and very seldom are sales made to Chinese middlemen. In Sabak Bernam a continued improvement is reported to be evident in the palms protected by the bund.

In Johore, two demonstration cabinet kilns have been erected in Kukup and one in the Batu Pahat District and the initial working was satisfactory and gained the interest of local cultivators. At Sungei Kluang, in Batu Pahat, several producers evinced a desire for a kiln of a larger capacity than the 30-acre cabinet used for the demonstration. Investigations are in hand to ascertain if a satisfactory cabinet kiln of the large capacity desired can be designed. In north Johore, similarly, a cultivator has expressed satisfaction with a 30-acre cabinet kiln he has erected, but desires one of a larger capacity.

Pineapples.—In Selangor, the main fruit season has commenced and the price of $1.20 per 100 obtained for fruit compares favourably with prices of former years in this State. Fruit from Bukit Changgang in Kuala Langat District is being sent to Singapore where prices of $2.50 to $3.50 per 100 are being paid for them. A new factory at Bukit Changgang is nearing completion and the planting of a large area alienated for the crop at Sijangkang has commenced. Two factories were in operation during the month.

In Johore, the main fruiting season which commenced in April is proving disappointing, as both the size and quality of the fruit are below expectations. Prices have been maintained everywhere and have appreciated in Johore Bahru to $2.40 to $2.50 per 100 fruit. Eight factories were operating during the month.

Agricultural Stations and Padi Test Plots.

Agricultural Stations.—In Province Wellesley, alterations to lay-out on Bukit Mertajam Station were decided upon and put in hand, whilst progress was made with the planting programme at Ayer Itam. At Kuala Kangsar Station the pruning of coffee was done and the harvesting of pepper commenced. Leaf eating beetles proved troublesome in the fruit area. At Tanah Rata, Cameron Highlands, various improvements to roads and drains were effected and alterations in the position of some of the machines in the factory were made with a view to more convenient working. In Selangor, demonstrations in making China tea were given at Cheras Station, whilst at Telok Datoh Station a small store and plant house was in course of erection, and cultivation for pineapple planting was carried out. In Malacca, the replanting of the pineapple area was completed at Sungei Udang Station and further planting was done in the fruit extension area, whilst a poultry night ark and nesting boxes were erected for demonstration purposes and, at the Farm School, a small cabinet copra kiln was erected for a similar purpose. In

Pahang, good progress was made with the planting programme at Raub Station. In Johore, felling on the Pineapple Station was completed and the fencing of Tangkah Station was commenced and tuba cuttings planted in the nursery. At the Pineapple Station in Singapore twenty-seven fruits from original selections were harvested and records of weight, flavour etc. made. Some of these selections are very promising.

Padi Stations and Test Plots.—At Sungei Manik Station the bunding of the new area was completed satisfactorily and work was continued on making a drying floor near the store. Transplanting was carried out on Kajang Plot in Selangor, at Ulu Klawang Plot in Negri Sembilan, at Kerdau Plot in Pahang and on some of the Plots in Johore.

District Show.

The Ulu Selangor District Show held at Kuala Kubu on 31st May and 1st June was opened by the Hon'ble the British Resident, Selangor. All classes were well supported and, although the main fruit season had not commenced, the total number of exhibits in that section approximated closely to the figure for last year. A feature of the Show was the livestock competition, ten preliminary competitions having been held at suitable centres and the best goats and buffaloes selected to compete in the final judging at the Show. The padi section was divided into six classes, a separate class being provided for each of the five varieties most commonly grown in the District and a sixth class for any other varieties. The Department of Agriculture exhibit included two types of small-holders' rubber smoke cabinets which were erected on the Show ground and demonstrations given by Asiatic Rubber Instructors. Rural Lecture Caravan films were exhibited in the evening. The organization of the Show was good and the programme of entertainments arranged added materially to the success. The attendance was good.

An Agricultural Show at Parit, Perak, on 31st May was the first function of the kind to be held in the Sub-district for fourteen years. The Show was opened by H.H. the Sultan of Perak who was accompanied by the Hon'ble the Acting British Resident and the Raja Bendahara of Perak. As with the Ulu Selangor Show, the season was a little too early for fruits, and some of the exhibits in this class were immature. The fourteen sections provided included, apart from purely agricultural products, livestock, arts and crafts, cakes and preserved fruits, a baby show and exhibits by Sakai. Entries were numerous and of great variety. In respect of agricultural products the classes were more numerous than is desirable and it would have been an improvement if those of small account commercially had been omitted, which would have allowed of more attention being given to the important products. The padi and rubber sections were run in conjunction with the All-Malayan Competitions for these products. There were some 300 entries in the padi section and 38 in the rubber section and some of these exhibits were exceptionally good. The first prize for padi went to a cultivator of Paya Besar for a good exhibit of a Radin type, whilst a small-holder of Bota secured the first prize for a good exhibit of smoked sheet prepared on a smoke cabinet built

according to the Rubber Research Institute design. The livestock section was well represented and brought forth some good exhibits of poultry, goats and buffaloes. The parade for judging the last-named, which took place outside the precincts of the Show ground, drew an enormous crowd of spectators. The Department exhibit consisted of a full size rubber smoke cabinet, models of it and of improved types of poultry houses suitable for use by small-holders. The Show was very successful in respect of both entries and attendance and the Assistant District Officer and other local residents are to be congratulated upon the result of their work and efforts in organizing the function.

DEPARTMENTAL NOTES.

Retirement of the Hon'ble Dr. H. A. Tempany, C.B.E.

The Hon'ble Dr. H. A. Tempany, C.B.E., Director of Agriculture, Straits Settlements, and Adviser on Agriculture, Malay States, relinquished duty prior to retirement on 22nd May, 1936, and has been granted two months leave. At the end of this period he will assume duty of his new appointment of Assistant Agricultural Adviser to the Secretary of State for the Colonies.

Mr. F. W. South, Chief Field Officer, has been appointed Acting Director of Agriculture, Straits Settlements, and Adviser on Agriculture, Malay States.

Mr. F. W. Birkinshaw, State Agricultural Officer, Perak, assumed duty as Acting Chief Field Officer on 20th May 1936.

Mr. D. H. Grist, Agricultural Economist and Editor, has been granted 8 months and 26 days leave on full pay with effect from 28th May, 1936. Mr. N. C. E. Miller, Assistant Entomologist, has been appointed Acting Agricultural Economist and Editor.

School of Agriculture, Malaya.

The School of Agriculture, Malaya, which reopened on 18th May, 1936, is now full to capacity and no fewer than 17 applicants for admission as private students have had to be refused for this reason during the past few weeks. Of the 80 boys in residence, 48 have been enrolled for the Two Years and 32 for the One Year Course. There are 48 Malays, 30 Chinese and 2 others. Thirty-nine are from the Federated Malay States, twenty-five from the Straits Settlements, fifteen from the Unfederated States and one from Sarawak.

It is unlikely that there will be any falling off next year in the demand for admission to the Two Years Course, and prospective candidates are, therefore, advised to make early application.

Coconut Experiment Station, Port Swettenham.

For the convenience of postal arrangemnts the Coconut Experiment Station, Klang, will, in future, be known as the Coconut Experiment Station, Port Swettenham.

Statistical.

MARKET PRICES.

May, 1936.

Major Crops.

Rubber.—The market weakened in the first week of the month, falling to 25 cents per lb.; a slight improvement occurred in the third week, but the price again eased at the close. Spot loose opened at $26\frac{1}{8}$ cents per lb., falling to 25 cents on the 8th and 13th May; it improved to $26\frac{1}{8}$ cents on the 16th May, and closed at $25\frac{5}{8}$ cents per lb. The average price for the month for No. 1. X. Rubber Smoked Sheet was 25.63 cents per lb. as compared with the April average of 26.49 cents. The London average price was 7.32 pence per lb., and the New York price 15.55 cents gold, as compared with 7.53 pence and 15.92 cents gold in the previous month.

Prices paid for small-holders' rubber at three centres during May are shewn in the following table.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, May, 1936.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.			Batu Pahat, Johore.			
	7	14	21	28	6	13	27	6	13	20	27
Smoked sheet	32.42	33.28	32.00	32.16	33.00	31.72	32.00	32.02		32.30	31.50
Unsmoked sheet	31.00	30.00	31.00	31.12	32.00	31.00	31.00	31.30	30.10	30.64	31.00
Scrap	27.10		28.00						26.90		27.00

Transport by F. M. S. R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent

No purchases at Kuala Kangsar on the 20th May.

Palm Oil.—The following table shews that the market for the Malayan commodities continued its downward trend.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1936.	Palm Oil in Bulk, c i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
May 1	17. 0 0	8. 15. 0
„ 8	16. 5. 0	8. 15. 0
„ 15	16. 0. 0	8. 10. 0
„ 22	15. 17. 6	9. 0. 0
„ 29	15. 15. 0	9. 0. 0

Copra.—The market improved during the month, but prices did not reach the higher levels recorded earlier in the year. The sun-dried grade opened in Singapore at $4.50 per picul and rose to $4.95 on the 20th May; thereafter it fell to $4.90, and closed at $4.85, the monthly average being $4.77 as compared with $5.03 in April. The mixed quality averaged $4.50 per picul as compared with $4.59 in the previous month.

Copra cake fell to $1.35 per picul, the average for the month being $1.40 as compared with $1.55 in April.

Rice.—The average wholesale prices of rice per picul in Singapore in April were as follows:— Siam No. 2 (ordinary) $3.95, Rangoon No. 1 $3.45, Saigon $3.67, as compared with the March corresponding prices of $3.85, $3.30 and $3.60. April 1935 prices were $3.97, $3.65 and $3.87.

The average retail market prices in cents per gantang of No. 2 Siam rice in April were:—Singapore 28, Penang 28, Malacca 25, as compared with 30, 28 and 26 respectively in March.

The average declared trade value of imports of rice in April was $3.66 per picul, as compared with $3.56 in March, and $3.46 in February.

Padi.—The price of padi at Government Rice Mills, Perak, was reduced from $2.10 to $2 per picul on the 20th May, but only negligible purchases were made during the month. Retail prices of padi ranged from 5 to 14 cents per gantang in different parts of the country.

Pineapples.—Only slight variations were made in the prices fixed by the Packers' Combine and averages per case for the month were: Cubes $3.12, Sliced

Flat $3.03, Sliced Tall $3.10, as compared with $3.16, $3.07 and $3.16 respectively in April.

Prices of fresh fruit per 100 were:—Selangor $1 to $1.80; Singapore $2; Johore 1st quality $1.80 to $2.50, 2nd quality $1 to $2.10 ($3 in Benut), 3rd quality 70 cents to $1.80.

Beverages.

Tea.—Eleven consignments of Malayan tea were sold on the London market during May. Two consignments were of upland tea and averaged 1s. 0¾d. and 1s 1d. per lb. respectively; the nine consignments of lowland tea were sold at average prices ranging from 11½d. to 1s. 0½d. per lb.

Average London prices per lb. during May for tea consignments from other countries were as follows:—Ceylon 1s. 2.64d., Java 10.79d., Indian Northern 1s. 0.54d., Indian Southern 1s. 1.43d., Sumatra 10.29d.

The latest Colombo average prices available are quoted from the *Weekly Tea Market Report,* 26th May, 1936, of the Colombo Brokers' Association, and are as follows (rupee cents per lb.):—High Grown Teas 72 cents, Medium Grown Teas 62 cents, Low Grown Teas 59 cents.

Coffee.—The price of Sourabaya coffee in Singapore during May improved to average from $13 to $14.07 per picul, but Palembang fell, averaging $7 to $7.94, as compared with $7.10 to $8.10 in April.

Prices of locally grown coffee ranged from $9 to $26 per picul.

Spices.

Arecanuts.—Singapore prices weakened considerably during May, the averages per picul being: Splits $4.95 to $5.96; Red Whole $4.38 to $5.75; Sliced $7.15 to $8.45.

The Singapore Chamber of Commerce average prices per picul were:—Best $6.35, Medium $5.90, Mixed $4.49, as compared with $6.12, $5.58, and $4.24 in April.

Pepper.—Nominal prices in Singapore were further marked down during May, and the averages of the quotations were: Singapore Black $8.05, Singapore White $15.80, Muntok White $16.30 per picul.

Nutmegs.—Prices in Singapore were low at the beginning of the month but improved in the second half. Average prices per picul were: 110's $27.50, 80's $28.50, as compared with $29.25 and $30.25 respectively in April.

Mace.—Both Siouw and Amboina were quoted unchanged throughout the month at $90 and $75 per picul respectively. The April average prices were $91.25 and $75 per picul.

Cloves.—Zanzibar and Amboina continued to be quoted nominally at $38 per picul.

Cardamoms.—Green cardamoms were quoted in the Ceylon Chamber of Commerce reports at Rs. 1.35 to Rs. 1.46 rising to Rs. 1.54 to Rs. 1.69 at the close.

Miscellaneous.

Tuba Root (*Derris*).—Decreased demand during May tended to lower prices slightly, and the Singapore market maintained a dull tone. Roots sold on rotenone content averaged $51 per picul, and roots sold on a basis of ether extract averaged $34 per picul. The April averages were $52 and $34.50 per picul respectively.

Gambier.—No. 1 Cube continued unchanged at $10.50 per picul, but Block fell to $5.25 at the close, with an average price for the month of $5.55 per picul, as compared with $6.25 in April.

Tapioca.—Prices in Singapore remained unchanged at: Flake, Fair $5.50, Seed Pearl $5.50, Medium Pearl $6.50 per picul.

Sago.—Pearl, Small Fair, improved to $3.90 per picul throughout the month, as compared with $3.80 in April. Flour, Sarawak Fair, weakened slightly to average $2.26 per picul as compared with $2.30 in April.

Tobacco.—Prices of locally grown tobacco were high in Kelantan, being: 1st quality $110 to $120 per picul, 2nd quality $80, 3rd quality $60. Elsewhere the range was: 1st quality, $20 to $45, 2nd quality $15 to $25, 3rd quality $10 to $16.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross. London, S.W.1.

GENERAL RICE SUMMARY*

April, 1936.

Malaya.—April imports of foreign rice were 55,952 tons, and exports 13,511 tons. Net imports during January to April aggregated 166,027 tons, an increase of 14.5 per cent. as compared with 1935†

Of the imports during April, 49 per cent. were consigned to Singapore, 20 per cent. to Penang, 6 per cent. to Malacca, 21 per cent. to the Federated Malay States, and 4 per cent. to the Unfederated Malay States. Of the total, 60 per cent. came from Siam, 33 per cent. from Burma, 6 per cent. from French Indo-China, and 1 per cent. from other countries.

Of the April exports, 76 per cent. were consigned to the Netherlands Indies, and 24 per cent. to other countries. The various kinds of rice exported were (in tons, percentages in brackets):— Siam 9,371 (69.4), Burma 3,415 (25.3), French Indo-China 567 (4.2), parboiled 42 (0.3), local production 116 (0.8).

India and Burma.—Foreign exports during the first quarter of the year totalled 386,000 tons, as compared with 630,000 tons in 1935, a decrease of 38.7 per cent. Of these exports 4.7 per cent. were to the United Kingdom, 18.9 per cent. to the Continent of Europe, 30.8 per cent. to Ceylon, 18.4 per cent. to the Straits Settlements and the Far East, and 27.2 per cent. to other countries. The corresponding percentages for 1935 were 4.6, 9.4, 20.3, 36.2 and 29.5.

Burma's total exports of rice and bran (*Bangkok Times*, 4th May, 1936) from the 1st January to the 28th March were 961,259 metric tons, as compared with 1,135,147 metric tons in 1935, a decrease of 15.3 per cent.

Siam and Japan.—The latest information available was published in the March Summary.

French Indo-China.—Entries of padi into Cholon during the first four months of the year totalled 672,181 metric tons, a decrease of 15.7 per cent. as compared with 797,461 metric tons in 1935. Exports of rice for the same period decreased by 24 per cent. from 811,102 metric tons in 1935 to 616,584 metric tons in 1936.

Netherlands Indies.—The latest information available was published in the February Summary.

Ceylon.—Imports during the first four months of the year totalled 186,435 tons, an increase of 8.2 per cent. as compared with 172,326 tons in 1935.

Europe and America.—Shipments from the East to Europe during the period 1st January to 10th April were 289,365 tons, an increase of 30.5 per cent. when compared with 221,736 in 1935.

Shipments for the Levant from the 1st January to 8th April were 4,891 tons, a decrease of 68.1 per cent., and to Cuba, West Indies and America 67,010 tons, an increase of 17.3 per cent.

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* Abridged from the Rice Summary for April, 1936, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1935.

MALAYAN AGRICULTURAL EXPORTS, APRIL, 1936.

PRODUCT.	Net Exports in Tons				
	Year 1935	Jan.-April 1935	Jan.-April 1936	April 1935	April 1936
Arecanuts ...	21,588	8,250	10,651	2,437	2,758
Coconuts fresh † ...	106,272†	31,924†	37,772†	9,099†	11,408†
Coconut oil ...	35,911	9,799	14,384	2,528	3,986
Copra ...	111,752	39,080	21,441	8,714	4,401
Gambier, all kinds ...	2,837	931	762	259	246
Oil cakes ...	11,361	2,691	4,028	456	1,073
Palm kernels ...	3,892	1,071	1,293	246	310
Palm oil ...	24,598	7,092	7,605	2,669	3,205
Pineapples canned ...	73,923	20,489	22,277	5,615	6,570
Rubber ¶ ...	378,381¶	131,468¶	112,306¶	34,680¶	28,307¶
Sago,—flour ...	10,920	4,595	1,450	869	1,908
,, —pearl ...	4,655	1,486	1,001	376	294
,, —raw ...	7,735*	2,127*	2,745*	404*	672*
Tapioca,—flake ...	1,953	582	687	78	187
,, —flour ...	755*	305*	630*	30	201*
,, —pearl ...	17,169	4,850	5,002	1,856	1,947
Tuba root ...	567	177	246	43½	58

† hundreds in number. * net imports. ¶ production.

MALAYAN PRODUCTION (IN TONS) OF PALM OIL AND KERNELS

(As declared by Estates)

Month 1936	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S
January ...	1,395.4	326.5	258.6	37.2
February ...	1,531.9	372.4	244.2	54.6
March ...	1,878.4	534.5	302.9	88.0
April ...	1,410.6	446.8	250.0	80.0
Total ...	6,216.3	1,680.2	1,055.7	259.8
Total January to April 1935 ...	4,152.2	1,222.4	659.5	177.1
Total for year 1935 ...	17,338.7	5,764.6	2,711.1	818.4

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 30TH APRIL, 1936.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1935	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING (*a*)		AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,526	1,125	2.5	16,832	37.8	695	1.6	17,957	40.3
Malacca	121,601	3,563	2.9	34,307	28.2	3,525	2.9	37,870	31.1
Penang Island	2,575	130	5.1	449	17.4	284	11.0	579	22.5
Singapore Island	34,525	3,919	11.4	10,369	30.0	417	1.2	14,288	41.4
Total S.S. ...	203,227	8,737	4.3	61,957	30.5	4,921	2.4	70,694	34.8
FEDERATED MALAY STATES :—									
Perak	294,988	14,234	4.8	72,735	24.7	14,923	5.0	86,969	29.5
Selangor	332,165	13,756	4.1	75,756	22.8	16,867	5.1	89,512	26.9
Negri Sembilan	258,304	16,313	6.3	54,975	21.3	17,093	6.6	71,288	27.6
Pahang	77,210	11,956	15.5	27,133	35.1	18,229	23.6	39,089	50.6
Total F.M.S. ...	962,667	56,259	5.8	230,599	24.0	67,112	7.0	286,858	29.8
UNFEDERATED MALAY STATES :—									
Johore	432,443	27,031	6.2	68,216	15.8	39,044	9.0	95,247	22.0
Kedah	199,607	3,880	2.0	22,423	11.2	19,349	9.7	26,303	13.2
Kelantan	30,474	403	1.3	10,280	33.8	5,424	17.8	10,683	35.1
Trengganu (*b*)	4,643	Nil	Nil	15	0.3	179	3.9	15	0.3
Perlis (*c*)	1,575	Nil	Nil	653	41.5	59	3.7	653	41.5
Brunei	6,010	Nil	Nil	2,582	43.0	856	14.2	2,582	43.0
Total U.M.S. ...	674,752	31,314	4.7	104,169	15.4	64,911	9.6	135,483	20.1
TOTAL MALAYA ...	1,840,646	96,310	5.2	396.725	21.6	136,944	7.4	403,035	26.8

Notes :—(*a*) Area out of tapping on Estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.
(*b*) Registered Companies only.
(*c*) Rendered quarterly.

MALAYAN RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF APRIL, 1936, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January to April 1936		during the month		January to April 1936						
	Ports	Dealers	Estates of 100 acres and over	during the month	January to April 1936	during the month	January to April 1936	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	January to April 1936
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	5,224	12,631	9,021	37,851	4,791	19,587	Nil	Nil	Nil	Nil	10,274	2,569	43,065	14,052	...	7,983	10,834	7	28
Johore ...	...	1,599	4,116	3,904	15,665	3,974	11,997	Nil	93	Nil	191	1,507	5,590	7,935	19,183	...	2,565	4,024	...	...
Kedah ...	...	124	3,272	2,223	9,949	992	2,473	Nil	Nil	Nil	Nil	1,283	2,339	5,106	7,892	...	337	2,652	...	...
Perlis ...	...	4	20	12	45	25	82	Nil	Nil	Nil	Nil	Nil	28	Nil	118	...	14	19	...	...
Kelantan ...	...	271	383	248	1,076	598	2,088	Nil	Nil	Nil	Nil	207	802	623	2,601	...	259	232	...	...
Trengganu ...	...	55	50	137	833	68	417	Nil	Nil	Nil	Nil	Nil	205	Nil	1,250	...	55	50	...	...
Brunei ...	...	3	46	24	161	77	238	...	...	...	...	...	118	...	420	...	8	24	...	...
Total Malay States	...	7,280	20,518	15,569	65,580	10,525	36,882	Nil	93	Nil	191	13,271	11,651	56,729	45,516	...	11,221	17,835	7	28
S. SETTLEMENTS :—																				
Malacca ...	...	1,409	1,269	929	3,930	498	2,167	Nil		Nil		1,506		8,583		...	2,069	1,187	...	...
Province Wellesley ...	...	480	571	376	1,522	186	821	Nil		Nil		5,273		29,454		...	1,036	527	...	...
Penang ...	1,500	4,968	6	15	64	19	284	1,732	10,950	10,147	43,724		Nil		Nil	1,035	5,299	8	...	...
Singapore ...	3,565	19,289	162	140	578	39	418	12,889		47,706		16,201		65,574		4,127	21,739	191	20	84
Labuan ...	...	28	Nil	Nil	Nil	11	60	81		314		Nil		Nil		...	16	Nil	...	...
Total Straits Settlements ...	5,065	26,174	2,008	1,460	6,094	753	3,750	14,702	10,950	58,167	43,724	22,980	Nil	103,611	Nil	5,162	30,159	1,913	20	84
Total Malaya ...	5,065	33,454	22,526	17,029	71,674	11,278	40,632	14,702	11,043	58,167	43,915	36,251	11,651	160,340	45,516	5,162	41,380	19,748	27	112

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	6,970	20,952	4,974	2,721	2,278	150
WET RUBBER	1,013	787	325	408	287	187
TOTAL ...	7,983	21,739	5,299	3,129	2,565	337

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to April 1936
29	30	31
Singapore ...	22,859	99,752
Penang ...	8,404	41,427
Port Swettenham.	4,717	18,211
Malacca ...	271	950
MALAYA ...	36,251	160,340

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to April 1936
32	33	34
Malay States ...	24,922	102,245
Straits Settlements	1,982	9,321
MALAYA ...	26,904	111,566

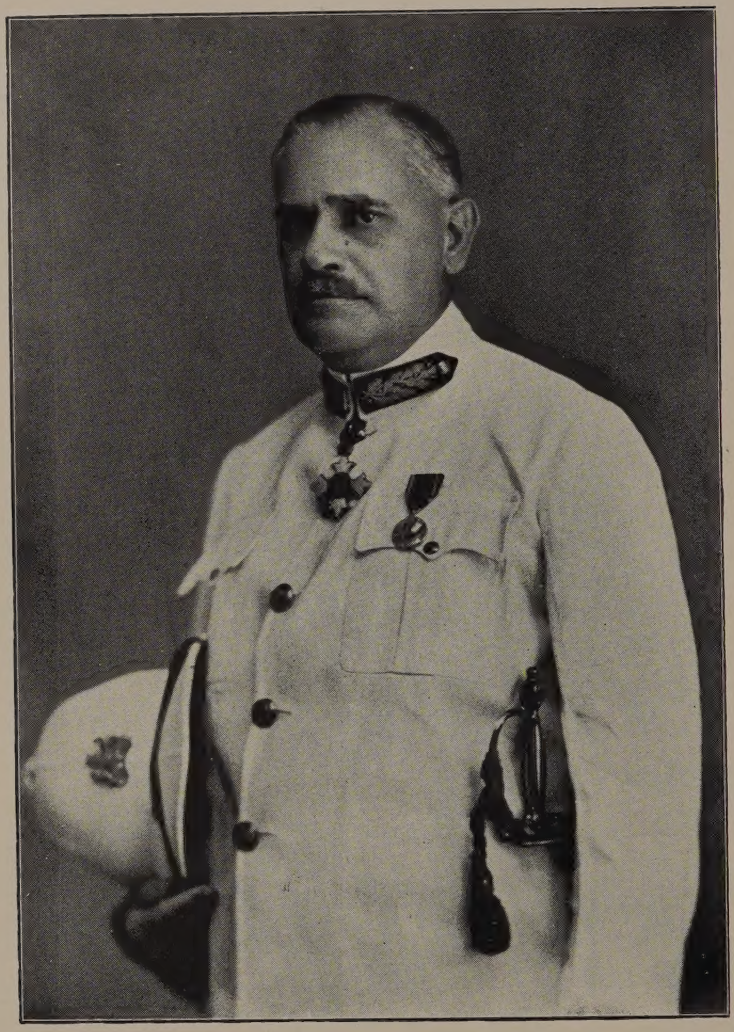
Notes :—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Column (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication, therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 22nd May, 1936.

METEOROLOGICAL SUMMARY, MALAYA, APRIL, 1936.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.	Mean of A and B.	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						Hrs.	Hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	92.7	73.2	82.9	96	70	86	76	85.5	85.8	13.67	347.2	3.42	18	14	6	5		211.95	7.07	58
Bukit Jeram, Selangor ...	89.7	73.6	81.7	92	72	87	75	85.7	87.1	3.22	81.8	1.10	15	11				243.30	8.11	66
Sitiawan, Perak ...	90.8	74.5	82.7	93	72	87	77	84.6	84.6	5.24	133.1	1.40	16	11	1			229.70	7.66	63
Temerloh, Pahang ...	90.5	73.1	81.8	94	71	86	77	86.2	85.7	10.38	263.7	2.04	19	16	3	2		223.30	7.44	61
Kuala Lipis, Pahang ...	90.7	71.9	81.3	93	70	89	74	85.3	85.0	7.26	184.4	1.82	20	18		16		211.75	7.06	58
Kuala Pahang, Pahang ...	87.3	75.3	81.3	89	73	84	80	85.5	85.2	6.54	166.1	1.24	15	11				231.30	7.71	63
Kallang Aerodrome, S'pore ...	87.0	76.2	81.6	90	74	81	79	82.5	83.4	7.00	177.8	2.08	18	11	4			184.70	6.16	50
Butterworth, Province Wellesley ...	89.5	75.0	82.3	91	72	87	77	87.2	86.3	4.40	111.8	2.10	18	13				253.05	8.43	69
Bayan Lepas Aerodrome Penang ...	89.0	75.3	82.1	91	73	87	78	86.0	85.6	10.76	273.3	2.86	19	18	5			241.00	8.03	66
Bukit China, Malacca ...	87.5	74.4	80.9	91	73	82	77	84.9	85.0	5.69	144.5	2.02	14	10	3		1	208.75	6.96	57
Kluang, Johore ...	89.7	72.0	80.9	93	70	85	74	82.6	82.4	11.06	280.9	2.92	23	19	9	8		175.20	5.84	48
Bukit Lalang, Mersing, Johore	86.3	72.6	79.5	91	70	80	74	82.3	81.5	7.36	186.9	3.36	18	14	2			227.00	7.57	62
Alor Star, Kedah ...	90.8	74.9	82.9	94	72	87	77	87.3	86.1	9.46	240.3	2.48	23	15	7	2		258.75	8.63	71
Kota Bahru, Kelantan ...	89.2	74.2	81.7	94	72	80	76	84.3	84.0	7.64	194.1	4.05	10	9	1			259.20	8.64	71
Kuala Trengganu, Trengganu	88.0	73.8	80.9	91	72	84	76	83.9	84.1	12.78	324.6	3.85	16	15		1		259.30	8.64	71
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	75.2	63.4	69.3	80	61	70	67	73.9	73.2	10.72	272.3	1.83	24	19		14		164.80	5.49	45
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	75.3	57.8	66.5	78	53	71	62	71.2	70.1	16.83	427.5	2.70	24	24	3	2		168.00	5.60	46
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.3	60.2	65.7	76	57	68	62			16.68	423.7	2.52	25	24	3	3		184.00	6.13	50

Compiled from Returns supplied by the Meteorological Branch, Malaya



Dr. H. A. Tempany, c.b.e.

RETIREMENT OF Dr. H. A. TEMPANY, C.B.E.

DIRECTOR OF AGRICULTURE, STRAITS SETTLEMENTS, AND ADVISER ON AGRICULTURE, MALAY STATES.

This is the last number of the *Malayan Agricultural Journal* in which the name of Dr. H. A. Tempany, C.B.E., F.I.C., F.C.S., will appear in the staff list of the Department of Agriculture, S.S. and F.M.S., of which he has been the Head during the last seven and a half years. We take this opportunity of placing on record the valuable work which Dr. Tempany has done for the improvement of local agriculture and also to congratulate him on his appointment as Assistant Adviser on Agriculture to the Secretary of State for the Colonies.

Dr. Tempany came to this Department in February, 1929, after service first as Government Chemist and Superintendent of Agriculture, Leeward Islands, and then as Director of Agriculture and Registrar of Co-operative Credit Societies, Mauritius.

The first matter demanding his attention was the internal re-organization of this Department, in order to ensure a greater measure of co-ordination in the activities of the various Divisions than had previously obtained, and to increase the extension work of the Field Division. His proposals to this end were accepted by Government and were brought into complete effect by the end of 1931. No sooner was this constructive work completed than financial depression which commenced in the following year necessitated considerable retrenchment of staff. This retrenchment Dr. Tempany successfully carried through with the minimum loss of efficiency in the general work of the Department and without materially affecting the new organization.

Prior to Dr. Tempany's arrival proposals for the establishment of a School of Agriculture for Malaya had been approved by Government. During the early part of his service it fell to Dr. Tempany's lot to give effect to these proposals which resulted in the opening of the School of Agriculture at Serdang in May, 1931. Dr. Tempany also paid particular attention to imparting an agricultural bias to the education given in the elementary vernacular schools, through the medium of school gardens; he further advocated the establishment of Farm Schools as a sequel to this training, with the object of disseminating through the peasantry a knowledge of modern improvements in agricultural practice. The first Farm School was opened in Malacca in August, 1935. Short courses on agricultural practice for village headmen were also instituted at the School of Agriculture, Malaya, with the same object.

In order further to assist the peasant proprietors, Dr. Tempany incorporated in recommendations to Government proposals for strengthening the staff of the Field Branch and for establishing numerous additional small Agricultural and Padi Test Stations where ocular demonstrations of improved methods are provided for local cultivators, and from which improved planting material can be distributed. There are now sixty-eight of these Stations and Plots scattered throughout the Peninsula.

In the course of his service Dr. Tempany was appointed by Government as Chairman of two Committees and one Conference, all of considerable importance.

The first of these was a Committee appointed in July 1930, to report on Rice Cultivation in Malaya. The result of the labours of this Committee is to be seen in considerable extension of the total acreage planted with rice over areas in which special systems of water control have been provided.

In December, 1930, Dr. Tempany was appointed Chairman of a Conference on the Malayan Pineapple Industry which resulted in legislation for the good of the industry and the provision of scientific assistance.

In April 1934, as a result of the low prices for copra and for oil palm products, a Vegetable Oils Committee was appointed with Dr. Tempany as Chairman. This Committee submitted a comprehensive study of the various factors influencing the situation. As a result of its recommendations relief was granted to these industries by Government in the form of reduction of quit rent and export duty. An organization of producers, in the form of the Vegetable Oils Section of the United Planting Association of Malaya, has also been an outcome of this Report. This Section is at present devoting particular attention to the possibility of establishing a special grade of copra on the market by means of a voluntary grading scheme.

Dr. Tempany also devoted considerable time and attention to the activities of the Rubber Research Institute of Malaya, of the Board of which he was President from April, 1929 to June 1934.

During Dr. Tempany's tenure of office the Head of this Department was made a member of the Federal Council of the Federated Malay States. Dr. Tempany himself was made a Commander of the Most Excellent Order of the British Empire in January, 1933.

The officers of this Department bid farewell to Dr. Tempany with regret and wish him the best of health and all success in his new appointment.